PB81-130502

Modesto Wastewate Facilities Improvements

(U.S.) Environmental Protection Agency
San Francisco, CA

Dec 79

U.S. Department of Commerce
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Current project planning focuses on a change from river discharge to agricultural reuse of treated effluent as the primary disposal mode. About 19,000 acre-feet of effluent would be made available annually for agricultural reuse. Continuous effluent discharge to the San Joaquin River would be replaced with intermittent winter discharge of higher quality effluent at greatly increased flow rates. This EIS has emphasized an evaluation of the impacts of urbanization, particularly those affecting prime and unique farmland. Initial project construction, when considered in the context of related sewer interceptor projects, will provide a net increase in treatment plant capacity. The City of Modesto has adopted or is actively considering a variety of planning and zoning measures to mitigate the projected urbanization impacts.

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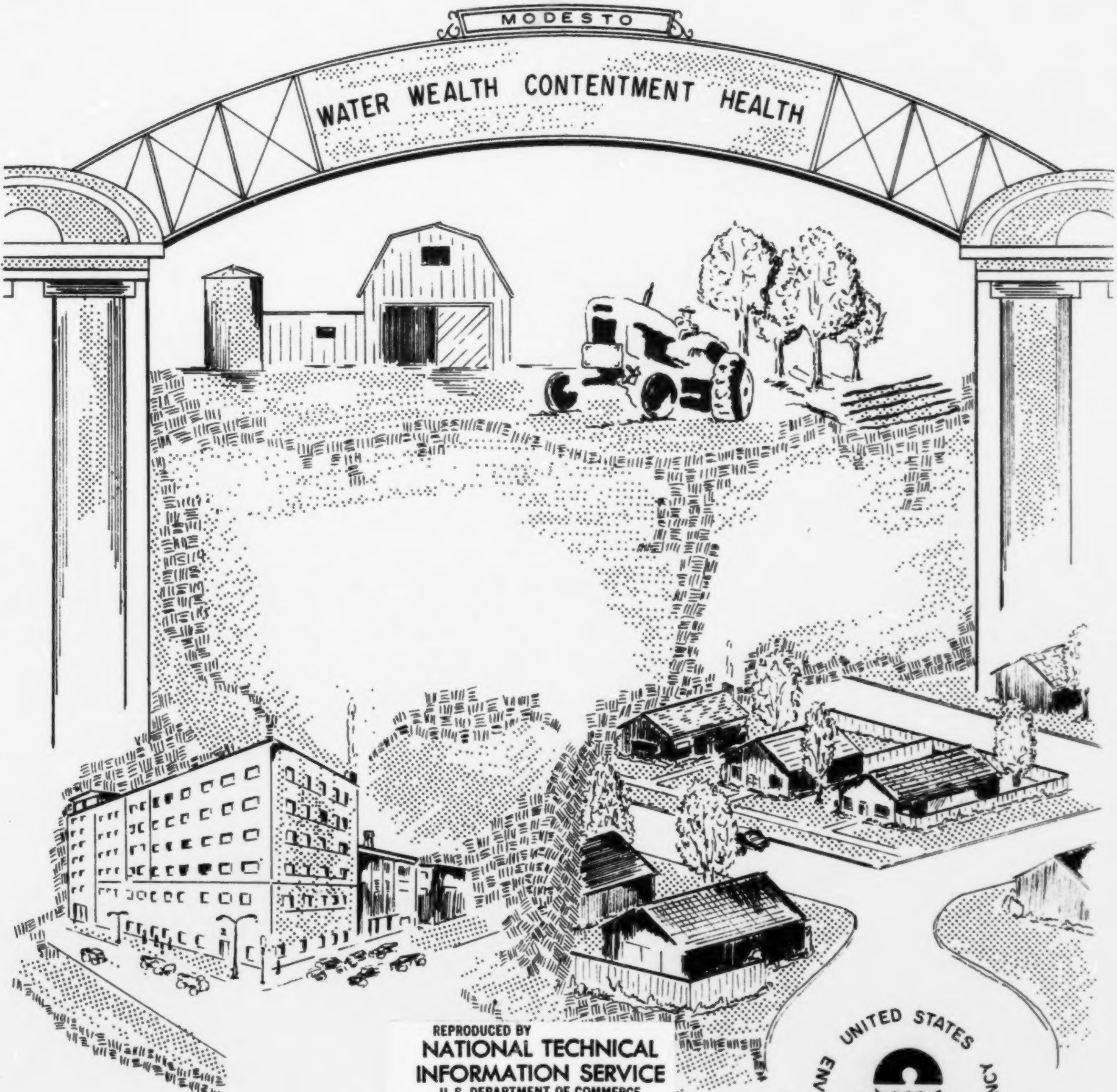
PB81-130502

MODESTO WASTEWATER FACILITIES IMPROVEMENTS

ENVIRONMENTAL IMPACT STATEMENT

FINAL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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DECEMBER 1979

FINAL

ENVIRONMENTAL IMPACT STATEMENT

MODESTO WASTEWATER FACILITIES IMPROVEMENTS

DECEMBER 1979

PREPARED BY

U. S. ENVIRONMENTAL PROTECTION AGENCY

REGION IX

215 Fremont Street

San Francisco, California 94105

With Technical Assistance by

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Clean Water Consultants
Hydroscience, Inc.

GRANT NO. CA-06-1063
RESPONSIBLE OFFICIAL

Paul De Falco Jr

Paul De Falco, Jr.
Regional Administrator
Environmental Protection Agency
Region IX

FINAL ENVIRONMENTAL IMPACT STATEMENT
MODESTO WASTEWATER FACILITIES IMPROVEMENTS

Lead Agency:

U. S. Environmental Protection Agency

Proposed Action:

Clean Water Grant funding for modification of the wastewater treatment and disposal facilities at the City of Modesto, Stanislaus County, California.

Abstract:

Current project planning focuses on a change from river discharge to agricultural reuse of treated effluent as the primary disposal mode. About 19,000 acre-feet of effluent would be made available annually for agricultural reuse. Continuous effluent discharge to the San Joaquin River would be replaced with intermittent winter discharge of higher quality effluent at greatly increased flow rates. Capital costs for the proposed project are estimated to be $12.1 million. The city's engineering consultants have estimated that 80 percent of this cost is eligible for federal and state grant funding.

This EIS has emphasized an evaluation of the impacts of urbanization, particularly those affecting prime and unique farmland. Initial project construction, when considered in the context of related (but separately funded) sewer interceptor projects, will provide a net increase in treatment plant capacity of 2.1 MGD (peak month, average daily flow basis). Planned future construction will provide an additional 7.0 MGD at an additional cost of only 5-10 percent of initial project construction costs. The cumulative 9.1 MGD capacity increase (from 43.9-53.0 MGD) is expected to accommodate 35,950 new city residents, annexation of 9,850 existing unsewered area residents plus associated commercial and industrial development. Seasonal industry flow increases are expected to utilize about 40 percent of the increased treatment capacity. This amount of development is expected to occur by 1995, and to involve urbanization of 4,615 acres of land, 3,585 of which are currently in cropland uses.

The City of Modesto has adopted or is actively considering a variety of planning and zoning measures to mitigate the projected urbanization impacts. These new measures are expected to increase the density of future development sufficiently to reduce the urbanization of prime farmlands by 3.7 percent after initial project construction, 10.2 percent after planned future construction, and 27.8 percent if continued to the year 2000. Measures adopted by the city since 1970 have also had a significant effect on the amount of prime farmland urbanized for any increment of new development.

The population forecasts used to design the proposed project are less than those incorporated into the locally prepared air quality management plan recently adopted by the state Air Resources Board. Thus, the proposed project is considered to be consistent with pending state implementation plan revisions.

Informational Contact:

Dave Jones or John Hamill, U. S. Environmental Protection Agency, Region IX, 215 Fremont Street, San Francisco, California, 94105. (415) 556-5694.

ORDER FORM FOR FINAL EIS DOCUMENTS, MODESTO WASTEWATER FACILITIES IMPROVEMENT PROJECT

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PREFACE

The Draft EIS on the Modesto Wastewater Facilities Improvements was released on April 27, 1979. Two public hearing sessions were held in Modesto on June 27, 1979. The formal comment period was held open until July 27, 1979. A total of 30 persons, interest groups, and government agencies have submitted formal comments concerning the Draft EIS. Additional, informal comments have been received from the City of Modesto. As a result of these formal and informal comments, several chapters in the Draft EIS have been significantly revised during preparation of this Final EIS. These changes are summarized below.

Chapters 3, 4, and 5 have been revised to reflect a new analysis of the capacity increase provided by the project, as well as new wastewater flow projections. Chapter 5 has been further revised to reflect the actions which the City of Modesto is taking to mitigate growth-related impacts on prime farmlands. Chapter 6 has been revised to reflect the current status of state and local air quality management efforts. The project-specific air quality analysis originally presented in Chapter 6 of the Draft EIS has been moved to the air quality appendices. A discussion of the water supply and water quality impacts of urbanization has been added to Chapter 7. A new Chapter 17 has been added to the EIS; this chapter presents and responds to the formal comments received during public review of the Draft EIS. Chapter 1, the EIS summary, has also been revised appropriately.

The City of Modesto has requested and is receiving expedited action on a portion of the proposed project. It is expected that "Step 2" (design specifications) funding for the sludge thickeners, sludge digester, and oxidation pond aerators will be authorized in the near future. These facilities do not by themselves increase wastewater treatment capacity, but will provide water quality improvement and odor reduction benefits.

The City of Modesto has not yet obtained "letters of intent" from landowners who will take the city's effluent. Thus, there is not yet a precisely defined proposed project. Once a specific storage pond alternative is selected and specific reuse arrangements are finalized, the State Water Resources Control Board can give "concept approval" to the project. EPA will then make a decision regarding approval of the project and award of a Step 2 grant. EPA's decision regarding award of a Step 3 grant (actual construction funding) will be based in part on the city's progress toward implementation of measures to mitigate the urbanization of prime farmland. Award of Step 3 funding may also depend on the adequacy of the State Implementation Plan revisions required by the federal Clean Air Act. Consistent with the regulations of the Council on Environmental Quality, EPA will prepare a public decision record discussing the decision made, the alternatives considered, and the actions which will be taken to mitigate the impacts of any project which is approved. This Final EIS will be a major element considered by EPA in making a decision on the project.

Chapter 1

INTRODUCTION AND SUMMARY

Introduction

The EIS Process

The National Environmental Policy Act of 1969 (NEPA) requires that all agencies of the federal government must evaluate the environmental consequences of actions they undertake or sponsor. Consistent with other essential considerations of national policy, agencies are directed to avoid or minimize possible adverse effects of their actions on the quality of the human environment. The major implementation tool of NEPA is the Environmental Impact Statement (EIS). An EIS serves as a decision-making document which describes and analyzes alternative actions or projects. The EIS process serves as a means of obtaining input into agency decisions from other federal agencies, state and local agencies, and the general public.

The Clean Water Grant Program

Water quality management has been the subject of considerable planning at federal, state, regional and local levels in California. The State Water Resources Control Board (SWRCB) serves as the state water pollution control agency. Actual implementation of state water quality policies rests largely with nine Regional Water Quality Control Boards (Regional Boards). The Central Valley Regional Water Quality Control Board has jurisdiction within both the Sacramento and San Joaquin Valleys.

The Porter-Cologne Water Quality Control Act of 1969 required each Regional Board to prepare a water quality control plan for its region and submit that plan to the SWRCB for approval. Each of these "basin plans" must identify beneficial uses to be protected, water quality objectives necessary to protect these uses, and a program of implementation to attain the water quality objectives. The key implementation tool involves establishment of waste discharge requirements for individual dischargers.

The Federal Water Pollution Control Act as amended in 1972 provides for a permit system (National Pollutant Discharge Elimination System [NPDES]) to regulate the discharge of pollutants into navigable water of the United States. This regulatory program is administered by the U. S. Environmental Protection Agency (EPA). The federal act provides that EPA can delegate this regulatory program to a state agency if that state has laws adequate to implement the purposes of the federal act. EPA has determined that the water quality control plans and waste discharge requirements established by the SWRCB and Regional Water Quality Control Boards meet this requirement. EPA, however, monitors the actions of the state and regional boards for compliance with the purposes of the federal act

To assist in achieving the water quality goals of the federal and state legislation, the SWRCB and EPA jointly administer a program to help pay the cost of improving publicly-owned wastewater treatment systems. The City of Modesto is applying through this program for funding to modify and its wastewater treatment system. This Clean Water Grant Program is administered by the SWRCB with EPA review prior to any grant award. Under this program, EPA provides grant funds to cover up to 75 percent of the planning and construction costs for eligible capital improvements, while the SWRCB provides funds for up to 12.5 percent of these costs. The grant applicant must fund the remaining portions of the project, plus all operating and maintenance costs. In order to obtain federal and state funding, local wastewater management projects must be planned and designed in accordance with various requirements established by EPA and the SWRCB. The most recent cost estimate for the proposed project is about 12.1 million dollars, with about 80 percent of this cost expected to be funded through federal and state grants (Jenks and Harrison, 1979).

Background to Development of this EIS

During initial project planning, the City of Modesto decided to evaluate irrigation reuse as an alternative to continuing the present practice of discharging effluent to the San Joaquin River. As a result two separate sets of engineering and environmental evaluations were prepared. An initial evaluation of facility alternatives was made through the 1976 project report (Jenks and Harrison, 1976) and an Environmental Impact Report (EIR) on the facility improvement aspects of the project (J. B. Gilbert and Associates, 1976). Separate engineering and environmental evaluations of irrigation aspects of the project were completed in mid 1978 (Jenks and Harrison, 1978a; J. B. Gilbert and Associates, 1978). Final project report and EIR documents were prepared in early 1979.

Following review of the 1976 EIR on the proposed facility improvements, EPA decided that a separate federal EIS document would be required as a basis for EPA decisions on whether, or under what conditions and stipulations, to award grant funds to the City of Modesto. Two of the major considerations which required analyses beyond that provided in the original Draft EIR involved the determination of realistically expected growth rates and the extent to which prime and unique farmlands would be urbanized by such development. Consequently, the EIS effort has involved several special studies related to these issues. Figure 1-1 illustrates the relationship of the current and ultimate project service areas to prime farmland in the Modesto area.

This document has, wherever appropriate, utilized data and analyses from the original project report and EIR. Contact has been maintained with both the project engineers (Jenks and Harrison) and the city's EIR consultants (J. B. Gilbert & Associates) so as to minimize duplication of effort and remain current on the status of project planning.

Report Format

This EIS has been organized into chapters which discuss individual issues which have been investigated during preparation of this EIS. The sequence in which issues are addressed reflects both their relative importance and a format which minimizes repetition. Each chapter addressing a major impact topic includes discussions of relevant project details, essential background information, impact analyses, and alternative mitigation measures.

The remainder of this chapter summarizes material presented in the main body of the EIS. For purposes of emphasis, discussions of mitigation measures are presented as a distinct section in this summary.

The analyses presented in this EIS are supported by a series of appendix documents, organized topically into four volumes: SOCIO-ECONOMIC APPENDICES; PRIME FARMLAND APPENDICES; EFFLUENT AND SLUDGE IMPACTS APPENDICES; and AIR QUALITY APPENDICES. These appendix volumes are available from EPA.

Overview of the Project and Major Issues

Existing Facilities and Facility Problems

The existing City of Modesto wastewater treatment system consists of primary treatment and sludge handling facilities at the southwestern edge of the city, and separate oxidation ponds for secondary treatment about 7 miles southwest of

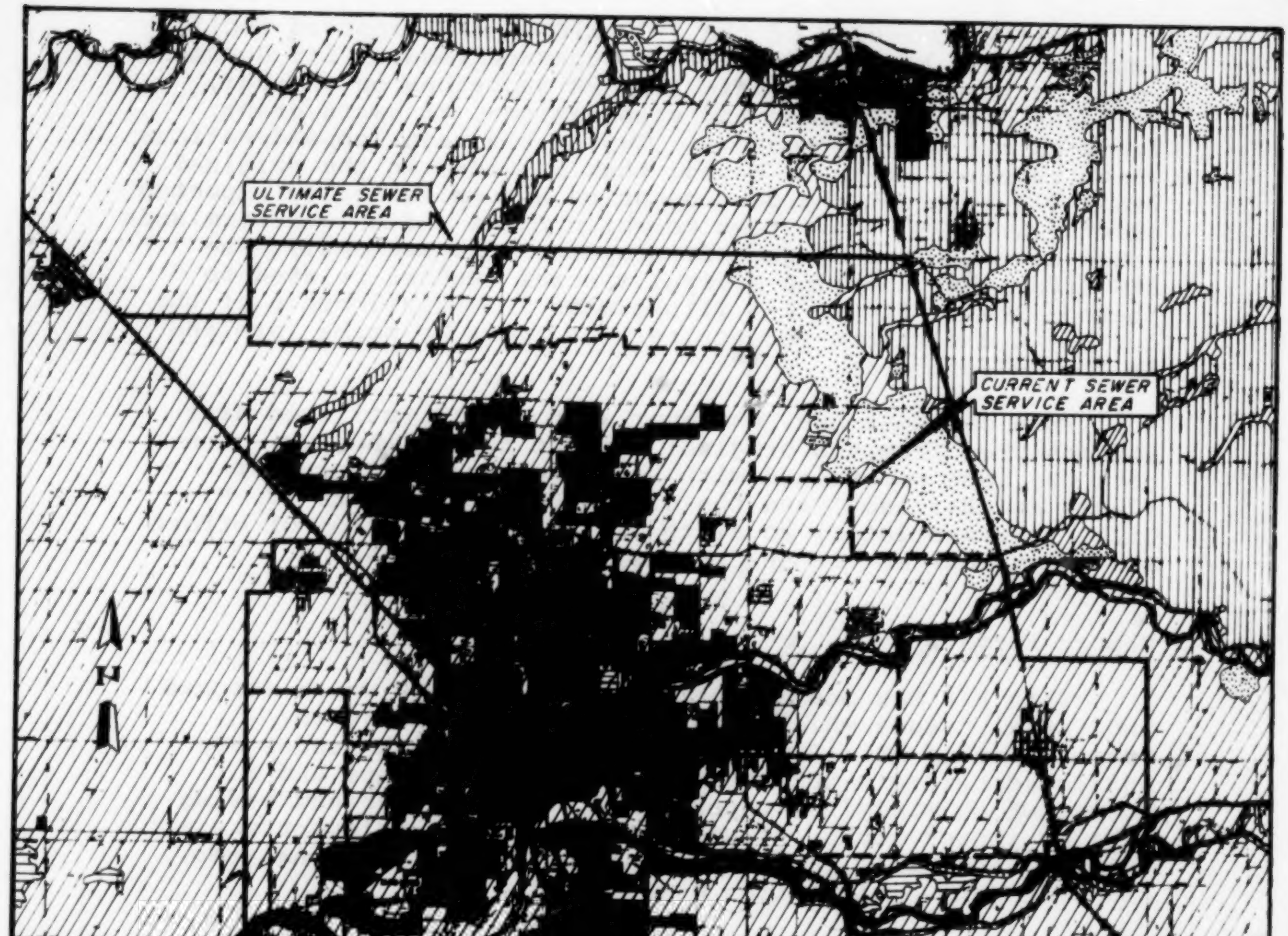

ULTIMATE SEWER SERVICE AREA
CURRENT SEWER SERVICE AREA
N
1/2 0 1 2
MILES
- LEGEND -
▨ PRIME, NO RESTRICTIONS
▤ RECLAIMED SALINE-ALKALI
▨ RECLAIMABLE SALINE-ALKALI
☐ RECLAIMABLE BY DEEP RIPPING
▥ NON-PRIME, RECLAMATION DIFFICULT

FIGURE 1-1
PRIME & NON-PRIME SOILS IN THE MODESTO AREA

the primary plant site. Current industrial pretreatment programs involve suspended solids and grit removal at food processing plants. Historical sewage flow data are presented in Figure 1-2. Projected sewage flows under two different growth rates are presented in Table 1-1. The capacity of the overall system is determined jointly by the influent pumps and the primary effluent pumping facilities. The existing influent pumps have a combined capacity of 43.9 MGD (million gallons per day) on a peak month, average daily flow basis. The existing primary effluent pumping facilities have a capacity of 44.1 MGD without normal standby facilities. Due to the structure of the city's interceptor and influent pumping system, the full capacity of the two existing influent pump stations is not available to handle summer peak flows.

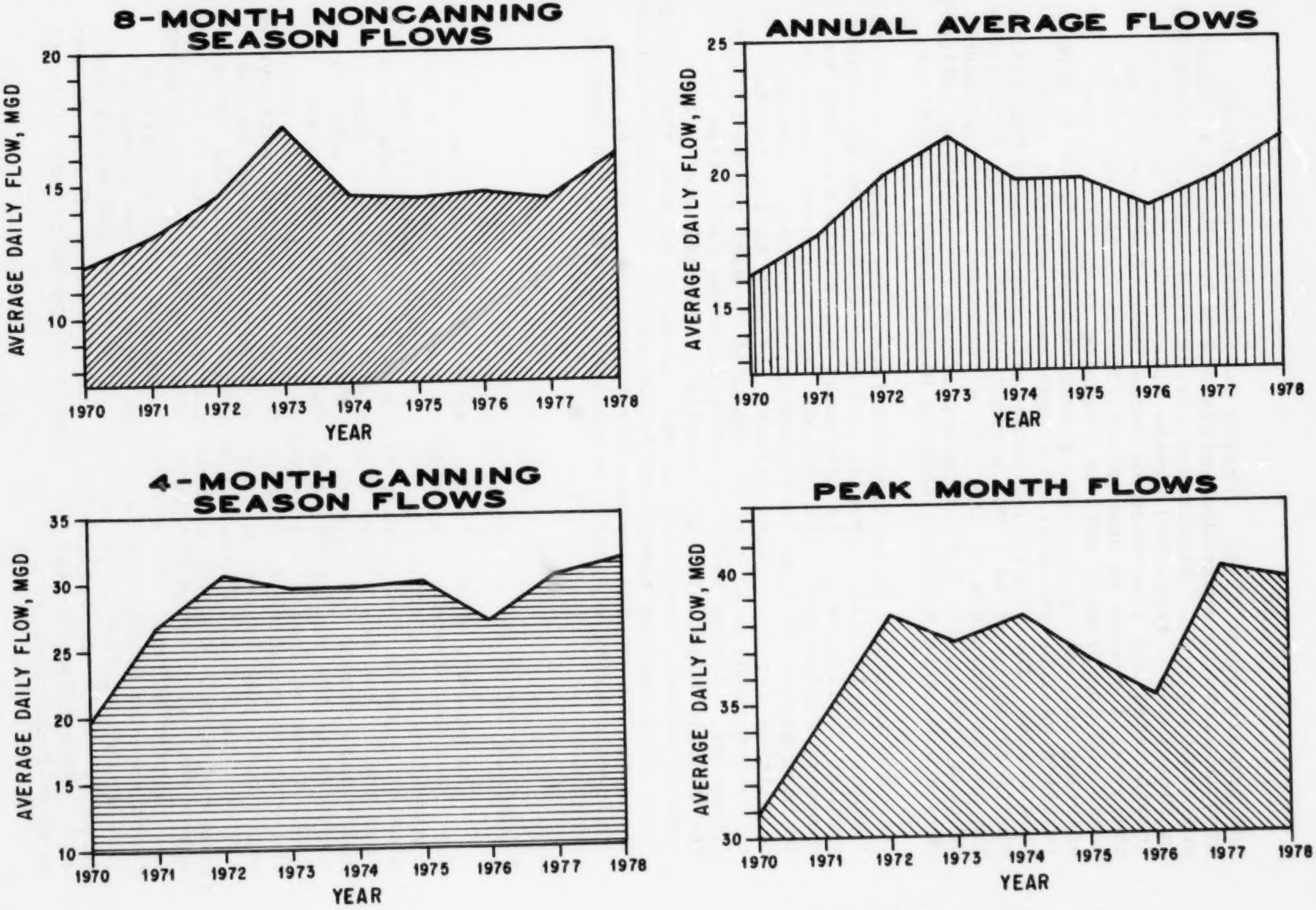
The existing facilities are faced with several problems relating to facility capacity and operation. Raw wastewater pumping facilities at the treatment plant site are used to capacity during peak flow periods, and thus need expansion to meet projected flow increases in the future. Pumping facilities for delivering primary effluent to the remote oxidation ponds must also be expanded to meet projected flow increases. Sludge handling and processing facilities at the primary plant site are greatly overloaded during the canning season, resulting in odor problems at both the primary plant site and the remote oxidation ponds. The city's effluent discharge to the San Joaquin River currently fails to meet effluent quality standards established by state and federal agencies.

Project Description

The project which the City of Modesto is seeking to implement would add a new influent pump station with a cross connection to one of the two existing pump stations; new booster pumps on the primary effluent pipeline to the oxidation ponds; two new sludge thickeners; a new sludge digester; additional sludge drying beds; 1,400 horsepower in additional aerators at the oxidation pond; and new chlorination and dechlorination facilities at the oxidation ponds. In addition, the city is pursuing development of an irrigation reuse system which will greatly reduce total effluent discharges to the San Joaquin River. Current planning anticipates the annual reuse of 6,082 to 6,450 million gallons (18,662 to 19,791 acre-feet) of treated effluent. This represents enough water to irrigate 5,500-6,000 acres of farmland. The irrigation reuse aspects of the project would require a new 100-acre (or larger) storage pond, numerous pipelines and associated pumps for effluent distribution, and a program of intermittent winter discharges to the San Joaquin River to reduce effluent storage requirements.

FIGURE 1-2

HISTORICAL SEWAGE FLOWS


8-MONTH NONCANNING SEASON FLOWS

ANNUAL AVERAGE FLOWS

4-MONTH CANNING SEASON FLOWS

PEAK MONTH FLOWS

DATA SOURCE: CAMPBELL, 1979

Table 1-1

PROJECTED SEWAGE FLOWS

Population and Sewage Flow Parameters	GG+A Forecast[1]					E-150 Forecast[2]				
	1980	1985	1990	1995	2000	1980	1985	1990	1995	2000
Population Factors										
1979 City Population[3]	99,200	99,200	99,200	99,200	99,200	99,200	99,200	99,200	99,200	99,200
Other 1979 Sewered Areas[4]	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Projected Annexations of Nonsewered 1979 Urban Area Residents[5]	667	4,002	7,337	9,837	12,337	667	4,002	7,337	9,837	12,337
Projected New City Growth[6]	1,866	11,735	22,568	35,934	50,768	2,465	15,740	30,748	47,813	67,118
Total Sewered Population	105,733	118,937	133,105	148,971	166,305	106,332	122,942	141,285	160,850	182,655
Total USSA Population[7]	129,642	141,195	153,589	167,042	182,202	131,833	146,009	161,709	179,163	198,500
Sewage Flow Components[8]										
Residential Flows, MGD[9]	7.9	8.8	9.7	10.8	11.9	7.9	9.0	10.2	11.5	12.9
Commercial Flows, MGD[10]	5.1	5.5	6.0	6.5	7.1	5.2	5.7	6.3	7.0	7.8
Nonseasonal Industry Flows, MGD[10]	5.1	5.5	6.0	6.5	7.1	5.2	5.7	6.3	7.0	7.8
Seasonal Industry Flows, MGD[11]	25.5	26.7	28.0	29.2	30.5	25.5	26.7	28.0	29.2	30.5
Sewage Flow Subtotals and Totals[8]										
Domestic Flows, MGD[12]	13.0	14.3	15.7	17.3	19.0	13.1	14.7	16.5	18.5	20.7
Base Flows, MGD[13]	18.0	19.8	21.7	23.8	26.2	18.2	20.5	22.9	25.6	28.5
Total Peak Month ADF, MGD	43.5	46.5	49.7	53.0	56.6	43.7	47.2	50.9	54.8	59.0

NOTES AND SOURCES:

[1] EIS "base case" forecast prepared by Gruen Gruen + Associates; see Chapter 5.
[2] Gruen Gruen + Associates extrapolation of the California Department of Finance countywide E-150 forecast; see Chapter 5 and Appendix A.
[3] California Department of Finance, 1979.
[4] Jenks and Harrison, 1976.
[5] Jones & Stokes Associates interpolation of annexation estimate made by Gruen Gruen + Associates, see Appendix A.
[6] Jones & Stokes Associates calculation using population forecasts prepared by Gruen Gruen + Associates, see Chapter 5 and Appendix A.
[7] USSA = ultimate sewer service area; see Figure 5-5. Jones & Stokes Associates interpolation of forecasts prepared by Gruen Gruen + Associates; see Appendix A.
[8] All flows given on a peak month, average daily flow basis in MGD (million gallons per day). ADF = average daily flow.
[9] Based on 74.6 gpcd (gallons per capita per day) sewage generation rate for 1979 residents and 64.5 gpcd sewage generation rate for new growth (lower flows due to mandatory use of low flow toilets in new construction).
[10] Based on USSA population and 39.2 gpcd sewage generation rate.
[11] Flow projections from Jenks and Harrison, 1976; estimated 1977 flows of 24.7 MGD with 0.25 MGD annual increase in flows.
[12] Residential plus commercial flows.
[13] Residential, commercial, and nonseasonal industry flows; equals 8-month noncanning season average flows.

The city is deferring the construction or installation of some facilities (a second primary effluent booster pumping plant, one pump at the first primary effluent booster pumping plant, and a bar screen and one pump at the new lower level influent pumping plant). These items will not be funded under the city's current grant request, although some of the facilities funded by the grant would be designed to accommodate future equipment installation. The deferred items identified above have an estimated capital cost of $471,400 (1980 dollars). Capacity increases provided by these facilities are dependent on completion of initial project construction. While future capacity increases may also require additional sludge processing facilities, it is clear that these planned future construction items will cost substantially less than the $12.1 million estimated for the proposed initial construction. Thus, this EIS has evaluated capacity aspects of both initial and planned future construction projects.

The City of Modesto has accepted the recommendations of the 1979 project report regarding irrigation reuse alternatives. That report notes that all effluent distribution alternatives are acceptable, but identifies reuse on the Chase, Gomes, and West Stanislaus Irrigation District areas as most desirable (effluent reuse alternative B). The city has not yet finalized arrangements for irrigation reuse on these areas. The 1979 project report also recommends that effluent storage be handled by a new 100-acre storage pond plus intermittent river discharge during the winter at a 70 MGD rate.

Major Issues Addressed by this EIS

The EPA's major concerns involve the indirect environmental impacts produced by development accommodated by the proposed project. These concerns have centered on the issues of urbanization of prime farmlands and possible interference with the timely attainment and subsequent maintenance of air quality standards. On August 30, 1976 the Council on Environmental Quality established uniform procedures for all federal agencies to follow when preparing an EIS that considers impacts on prime farmlands. On September 8, 1978 EPA adopted a policy to protect significant agricultural lands from irreversible conversion to other uses. Specific requirements for evaluating air quality consequences of urban development accommodated by wastewater treatment projects are contained in the 1977 amendments to the Clean Air Act. Other growth-related impacts (traffic, noise, resource use, and water supply issues) have also been addressed by this EIS.

Most of the growth-related topics addressed in this EIS involve issues which have developed gradually over time due to the cumulative impacts of numerous small changes. It has become apparent during analysis of these issues that it is futile to try to identify thresholds at which incremental, project-specific impacts might be considered "significant". Potential areas of cumulative impacts (e.g., urbanization of prime farmlands, loss of wildlife habitat, air pollution, school overcrowding, traffic congestion, etc.) seldom become major issues because of a single incremental change. Attempts to evaluate the incremental significance of project impacts in these areas are likely to obscure the basic nature of the problem and hinder efforts necessary to resolve the basic issues involved. This EIS has identified the incremental magnitude of indirect, growth-related impacts while assessing their significance from a broader perspective.

Attention has also been paid to more direct types of project impacts. Issues which have received the most attention include effluent reuse impacts on soils and crops; public health concerns regarding effluent reuse; project impacts on fish, wildlife, and vegetation; and sludge disposal issues.

The results of these EIS analyses are summarized in the following sections of this chapter.

Growth Accommodation

The amount and nature of the growth which will be accommodated by the project has itself been an issue. The current city facilities are limited by insufficient pumping capacity at the influent pump stations and the primary effluent pumping system. The proposed project will solve this problem by adding additional effluent pumping facilities and a new pump station designed to accept the sewage carried by the recently approved West Trunk interceptor.

The new influent pump station would be designed to house four pumps, although only three would be installed initially. Initial project construction would install 8.6 MGD in new influent pumping capacity. Planned future installation of a fourth pump would add 6.4 MGD in pumping capacity, giving the new pump station a total capacity of 15 MGD. These increases in influent pumping capacity would be partially off-set by a change in the city's sewer trunk system. The existing upper level pump station has a capacity of 14 MGD. Winter sewage flows presently exceed this capacity. Planned changes to the city's sewer trunk system will shift a significant portion of these existing flows to the new influent pump station. The areas of the city which will continue to be served by the existing pump station are, for the most part, already developed. Thus, about 6 MGD of pumping capacity at the existing upper level pump station will become effectively unusable due to the lack of a cross-connection to either of the other pump stations. Adjusting for this factor, usable influent pumping plant capacity will be increased by 2.1 MGD (from 43.9 MGD to 46.0 MGD, a 4.8 percent increase) by initial project construction, and by an additional 7.0 MGD (to 53.0 MGD, a cumulative 20.7 percent increase) by planned future construction.

New primary effluent pumping facilities would provide reliable standby pumping and increase pumping capacity to 47.1 MGD following initial project construction. Planned future construction would increase primary effluent pumping capacity to about 52.8 MGD (a value which is somewhat uncertain at present). Thus, both the influent pumping facilities and the primary effluent pumping system can be expected to serve as dual capacity constraints in the future.

The amount of growth accommodated by the initial and planned future construction projects has been analyzed under the assumption that the influent pumping plants serve as the most immediate capacity constraint. The sewage flow projections prepared for this Final EIS involved separate projections of residential, commercial, nonseasonal industry, and seasonal industry flow components. Residential flows were analyzed as several separate components: flows from existing sewered residents; flows from existing area residents who are not served at present but are expected to be annexed to the city or otherwise sewered in the future; and flows from projected new city residents. The city can exercise a significant amount of control over how the available treatment capacity is allocated to various types of flow sources.

Construction of the proposed project is unlikely to affect recent or projected development rates in the Modesto area. Local agency planning (as well as planning by private development interests) inherently assumes that public services and facilities will be provided as needed. The capacity provided by the project will determine the time frame during which the project can serve expected growth, but will not determine the rate at which this growth occurs. Table 1-2 identifies the growth accommodated by initial and planned future construction, based on the flow projections summarized in Table 1-1. The flow projections in Table 1-1 indicate that peak month average sewage flows should equal the 43.9 MGD nominal capacity value of the plant in 1980. These projections also indicate that about 40 percent of the 9.1 MGD ultimate capacity increase will be used by new seasonal industry flows. New residential flows are expected to account for about 31 percent of this capacity increase, while commercial and nonseasonal industry flow increases should each require about 15 percent of the new plant capacity.

If the city were to implement policies and work with local seasonal industries so as to prevent future increases in peak month seasonal industry flows, more residential development could be served by initial and planned capacity expansions. Assuming no increase in peak month seasonal industry flows and no annexations, initial project construction would accommodate about 20,300 new city residents while planned future construction would accommodate a total of about 68,800 new residents. Under the GG+A population forecast, these growth increments would be reached in 1989 and 2005, respectively. Under the E-150 forecast, these growth increments would be reached in 1986 and 2000, respectively.

Table 1-2

AMOUNT OF GROWTH ACCOMMODATED BY THE PROPOSED PROJECT

	Rate of Population Growth			
	GG+A Forecast[1]		E-150 Forecast[1]	
	Initial Construction	Planned Future Construction[2]	Initial Construction	Planned Future Construction[2]
Number of New City Residents[3]	10,100	35,950	11,300	40,050
Number of Residents Annexed[3]	3,450	9,850	2,950	8,750
Total Number Accommodated[3]	13,550	45,800	14,250	48,800
Expected Date of Capacity Utilization	1984	1995	1983	1992

Notes:

1. EIS "base case" forecast prepared by Gruen Gruen + Associates.
2. Extrapolation of California Department of Finance countywide E-150 forecast.
3. After January 1, 1979.

SOURCE: Jones & Stokes Associates calculations based on capacity analysis and flow projections summarized in Table 1-1.

Urbanization of Prime Farmlands

The implementation of the Modesto wastewater facilities plan will allow conversion of prime agricultural lands in Modesto and the surrounding areas to urban uses.

Prime farmland is land suitable for farming or silviculture possessing attributes established by the Soil Conservation Service (SCS). The impact of this conversion has been addressed, in Chapter 5, by evaluating the importance of prime farmlands from the national, state and local perspectives. Variations in the level of crop acreage and crop yield are discussed and data are presented on the conversion of farmland to nonagricultural uses. Estimates of the projected conversion of prime farmland in and around Modesto are provided, and possible measures for mitigating the impact of urban expansion in Modesto on the prime farmland resources of Stanislaus County are discussed.

National Trends

In 1975, the SCS inventoried 384 million acres of prime farmland in the United States. Of this total, 250 million acres were in cropland, 77 million acres were in pasture and range, 43 million acres were in forest land, and 14 million acres were in miscellaneous other uses.

Approximately 5 million acres of cropland were converted to urban and water uses between 1967 and 1975. About 83 percent of this acreage (4.5 million acres) was classified as prime farmland by SCS. Other irreversible conversion of prime farmland involved 2.9 million acres withdrawn from pasture and range, forests and other uses. Total conversion of prime land to urban and water use was 7.4 million acres over the 8-year period, or slightly less than a million acres per year.

Stanislaus County Trends

Stanislaus County ranks sixth among California counties in the value of agricultural production. Approximately 754,400 acres of the county's total area of 967,000 acres are currently in agricultural uses. There are 300,000 acres of prime land (SCS) of which approximately 22,500 acres are in urban land use.

There has been a net decrease of 128,000 acres in agricultural acreage since 1958 due largely to a change in status of rural lands from productive agricultural use as pasture or rangeland to an idle status. However, some of the best agricultural lands in Stanislaus County are being irretrievably converted to urban and industrial uses.

Modesto Study Area

Studies conducted for this EIS included development of special population and land use forecasts. Forecasts to the year 2000 were prepared for a study area based on housing and employment relationships. This study area included the communities of Modesto, Ceres, Salida, and Empire. The growth in study area employment and population between 1979 and 2000 will increase the amount of land in urban uses and decrease the amount of land remaining in undeveloped uses including agriculture. In the study area as a whole 7,835 acres will be added to the existing developed land. The wastewater treatment project would serve the portion of that land which develops as part of the City of Modesto, or about 6,440 acres. That 6,440 acres is expected to include about 4,000 of the 7,775 vacant acres within the current sewer service area (City of Modesto, 1978a). Of that 4,000 acres, 3,000 are expected to be converted from agricultural use and 1,000 from idle conditions. The remaining 2,440 acres of land urbanized by the year 2000 would include 2,320 acres of prime agricultural land located between the boundaries of the current and ultimate sewer service areas. The total amount of agricultural land absorbed by urban use as part of the City of Modesto will therefore be about 5,320 acres by the year 2000 (ranging from 3,980 to 6,380, depending on the actual density at which future development occurs).

Table 1-3 summarizes alternative urbanization projections in terms of the project service area and the time frame for expected capacity utilization. The capacity provided by initial and planned project construction is expected to service development of 4,615 acres, of which 3,585 acres are presently in cropland use. In 1976, the current sewer service area (CSSA) encompassed 24,420 acres, of which 16,645 were developed. The ultimate sewer service area (USSA) encompassed a total of 36,470 acres at that time, of which 18,195 were developed. The Modesto city limits enclosed 14,720 acres in 1976, of which 11,651 were developed.

Recognizing the variations in crop type and production in Stanislaus County, the estimated average value of production from cropland in 1977 was $965 per acre. Using this average value of annual crop production, development accommodated by initial project construction would result in a direct annual loss (at the year of capacity use) of $640,000 to $790,000 (1977 dollars) in crop production value for Stanislaus County. By the time of capacity use for planned future construction, the value of lost crop production would be $2,620,000 to $3,490,000 per year.

Modesto's food processing industry is not critically dependent on the level of agricultural production in Stanislaus County. Rather, the industry uses farm products from throughout the Central Valley and elsewhere. While food processing will remain a vital element of the local economy, employment in the industry will constitute a decreasing share of total local employment in coming years. The conversion of nearby prime agricultural lands to urban use is unlikely to jeopardize the city's economic health.

Table 1-3

PROJECTED URBANIZATION PATTERNS IN THE CURRENT AND ULTIMATE SEWER SERVICE AREAS

	Growth Scenarios					
	GG+A Population Forecast at High Density		GG+A Population Forecast at Low Density		E-150 Population Forecast at Low Density	
Parameter	1984	1995	1984	1995	1983	1992
Total City Population	112,750	145,000	112,750	145,000	113,450	148,000
New City Population	10,100	35,950	10,100	35,950	11,300	40,050
New Dwelling Units	3,360	15,530	3,360	15,530	3,630	16,670
Land Absorption (gross acres)	880	3,625	1,095	4,615	1,090	4,650
New CSSA Development (gross acres)	880	3,625	1,095	4,000	1,090	4,000
On cropland	660	2,720	820	3,000	820	3,000
On other undeveloped land	220	905	275	1,000	270	1,000
New USSA Development (gross acres)	0	0	0	615	0	650
On cropland	0	0	0	585	0	620
On other undeveloped land	0	0	0	30	0	30
Total Cropland Urbanized (acres)	660	2,720	820	3,585	820	3,620

Notes:

Years used represent the expected dates of capacity utilization for initial and planned future capacity expansions at the Modesto treatment plant.
Total City Population includes both new growth and annexations of existing unincorporated area residents after 1979.
Land Absorption acreage includes commercial, industrial, and other land uses in addition to residential land uses.

Data Source: Forecasts prepared by Gruen Gruen + Associates.

Likely effects of Modesto's ongoing growth do, however, include the continued loss of small family farms, loss of rural values and lifestyles, and changes in the character of the urban community, including an increased sense of impersonality and a decreasing confidence in personal security as the city grows.

Air Quality Impacts of Urbanization

Current Air Quality Problems

Ambient air quality levels in Modesto exceed federal and state standards for ozone, carbon monoxide and suspended particulates. Carbon monoxide problems occur during the winter, and are related to traffic congestion. Levels have remained essentially constant since the early 1970s. Ozone problems occur during the spring, summer and fall. Peak ozone levels and the frequency of levels over the federal standard have both declined since the early 1970s. Particulate levels have shown no clear trends.

Stanislaus County has been designated a nonattainment area for ozone, carbon monoxide and particulates. The Stanislaus Area Association of Governments has responsibility for developing a program to achieve and maintain the federal ozone and carbon monoxide standards as required by the Clean Air Act. The California Air Resources Board has assumed responsibility for developing programs to reduce particulate levels. The 1977 Clean Air Act Amendments require attainment of federal standards no later than 1982. If all reasonably available measures are implemented and ozone or carbon monoxide levels still cannot be reduced to the federal standards, then EPA can grant a time extension of up to 5 years to allow development and implementation of additional control measures. Failure to develop an acceptable implementation plan within the time frame specified in the Clean Air Act will result in a suspension of federal funding to most highway projects, and perhaps other federal funding programs as well. In addition, failure to attain the federal standards or develop an acceptable implementation plan within the time frame specified by the Clean Air Act will result in a prohibition on construction or modification of major stationary sources (industrial facilities).

Future Pollution Potential

The nonattainment plan for Stanislaus County projects that ozone levels in the county will continue to exceed the new federal standards until about 1984. The plan evaluated a variety of federal, state, local agency and private actions to attain these standards. The measures adopted in the locally-approved plan provide for continuing reduction in organic emissions. While these measures provide for attainment of the federal ozone standard by 1984, the state ozone standard would continue to be violated through 1995. The nonattainment plan also indicates that federal standards for carbon monoxide will be met by 1980.

Impacts of Irrigation Reuse Alternatives

Modesto's existing wastewater treatment facilities produce an effluent which frequently does not meet the quality standards required for discharge into the San Joaquin River. Thus the current practice of effluent disposal through river discharge is often in violation of state and federal regulations. One solution to this problem would be the addition of new facilities designed to treat effluent to the level required for river discharge. However, a more cost-effective alternative, as determined by the 1976 Jenks and Harrison project report, would be the distribution of treated sewage effluent to local farmers for use as an irrigation water supply. Eight distribution alternatives have been proposed, involving seven farms located in the vicinity of the Modesto oxidation ponds, and the West Stanislaus Irrigation District, located west of the San Joaquin River. The irrigation reuse option is discussed below in terms of its potential environmental effects. A more detailed treatment of these topics is presented in the body of this EIS and Appendix F.

Soils and Crops

Although generally suitable for irrigation use, Modesto's effluent exhibits certain chemical characteristics which could adversely impact soils and crops at reuse sites. In particular, potential hazards exist for soil salinization, soil permeability reduction, and toxicity effects in certain crops due to the levels of specific ions found in the effluent. Where existing soil conditions are poor or where sensitive crop types are grown, the possibility of damage to soils and crops due to prolonged irrigation with this water would be increased, although appropriate management techniques can be applied to offset these hazards.

Irrigation reuse of effluent would have beneficial effects on soils and crops by supplying the major plant nutrients as well as essential trace elements. Application of this water to cropland would reduce or eliminate the need for fertilizer applications. Agricultural benefits of irrigation reuse of this water also include the provision of a dependable water supply to farmers, enabling continued crop production during periods of water shortage.

Assuming that the recommended management procedures are followed, the irrigation reuse alternative offers a generally favorable outlook in terms of impacts on soils and crops.

Water Quality

Groundwater. The irrigation of cropland with Modesto effluent could impact groundwater quality in several ways.

Where effluent replaced irrigation water supplies of good quality, the increased salt loadings in percolating drainage waters could degrade the quality of shallow groundwater bodies over localized areas. In addition, other specific wastewater constituents such as nitrogen, chlorinated hydrocarbons, and pathogens could degrade groundwater quality. However, it is unlikely that these constituents would either: 1) exceed existing levels found in agricultural drainage waters from freshwater irrigated sites; or 2) remain in deeply percolating waters in sufficient concentration to provide a hazard in the use of local domestic or agricultural wells.

In a broad context of receiving groundwater bodies, mixing and dilution of drainage waters from effluent irrigated sites would considerably reduce impacts of effluent irrigation. Localized effects may be experienced as increased salinity in shallow water tables, which could have a salinizing effect on overlying soils. Other possible localized impacts could result from the use of shallow aquifers which are directly recharged by deeply percolating drainage waters from effluent sites.

San Joaquin River. The segment of the San Joaquin River between Fremont Ford and Vernalis has been designated by the State Water Resources Control Board (1975) as a "water quality limited" stream segment. Water quality problems involve high TDS (total dissolved solids) levels, low dissolved oxygen levels, and summer nutrient levels which stimulate algal blooms. The present discharge from the Modesto oxidation ponds contributes to these and other water quality problems in the lower San Joaquin River. Concerns relate to suspended solids, BOD (biochemical oxygen demands), nutrient, TDS, and toxicity loads added by the discharge.

A modeling study for flows in July and September 1976 was conducted to represent a relatively dry year (but not highly unusual) flow condition. Under summer flow and discharge conditions (July), the city's effluent exerted only minor effects on BOD and algal levels in the river. During the fall period (September), the effluent added slightly to the TDS concentration (as indicated by conductivity) and substantially to the BOD, algal, and ammonia levels in the river. The modeling studies also showed that much of the BOD load exerted by the effluent was attributable to the death and decomposition of algae contained in the effluent. Thus, eliminating the current year-round discharge will have little effect on water quality in the river during the summer; significant reductions in BOD, algal and nitrogen levels should be noted during the fall.

Fisheries, Wildlife and Natural Vegetation

San Joaquin River. A variety of warm-water game and nongame species inhabit the San Joaquin River. Steelhead have been eliminated, and the salmon population reduced by varous impoundments.

The current discharge of effluent adds somewhat to river flows, but the beneficial aspect of providing additional water flow is at least occasionally offset by adverse effects on water quality. The major impacts of Modesto's effluent on fish populations probably involve reductions in dissolved oxygen levels (due to BOD loads) and toxicity from residual chlorine. Available data indicate the city's current discharge may exert toxic effects on salmon and other sensitive fish species even when thoroughly diluted by upstream flows.

Eliminating the current year-round discharge, while reducing river flows, will significantly improve water quality from a fisheries standpoint. The intermittent winter discharges will provide temporary flow increases in the river which may be valuable during dry years. But the potential for rather low dilutions (occasionally less than 10:1) would indicate potential problems with residual chlorine levels even if the current 0.1 mg/l discharge limit is maintained. Effluent BOD levels may also exert a significant effect on dissolved oxygen levels during low river flow periods. One question which remains unanswered is whether the cumulative fisheries impacts of the intermittent discharge program would be greater or less than the impacts of a continuous discharge which meets current standards.

Removal of direct discharge will probably not have an immediate detectable impact on riparian vegetation and wildlife, since stream flow reductions would generally be less than 5 percent. For both aquatic and terrestrial biota, however, habitat loss and degradation are typically due to numerous minor changes, none of which is significant in isolation, but which are significant on a cumulative basis. From a fisheries standpoint, the most favorable project alternative would be upgraded secondary treatment, complete dechlorination, and effluent disposal by continuous river discharge. This would also be the most costly project alternative.

Pond and Irrigation Areas. Construction of storage ponds would displace a variety of animals and eliminate breeding habitat, escape cover, and hunting areas. As a result, there will be a net decline in the local wildlife population. Creation of additional storage ponds will increase resting areas for waterfowl, especially migrants; however existing ponds and the river already provide ample resting areas. Thus this aspect of the proposed project may reduce wildlife populations in the project vicinity.

Treated effluent would be used at most irrigation areas as a substitute for currently utilized irrigation sources. Some irrigation areas, however, contain uncultivated areas that might be put into production. Most such uncultivated land is on the Mapes Ranch (Lyons property). Smaller acreages of uncultivated land are present on the Chase property and the Ott property. There may be additional uncultivated areas within the West Stanislaus Irrigation District, or in adjacent land which could be annexed to the district.

One endangered species, the Aleutian Canada goose, is known to winter on one of the potential irrigation areas (the Mapes Ranch). No other rare or endangered wildlife species are known to occur on any of the potential irrigation areas.

The conversion of uncultivated areas to cultivated crop production eliminates most or all native and naturalized vegetation from the affected area. Most associated wildlife is also eliminated by such conversions. Conversion of uncultivated areas to irrigated pasture usage has fewer detrimental wildlife impacts, and is likely to prove beneficial to some species. The endangered Aleutian Canada goose appears to utilize irrigated pasture areas in preference to uncultivated areas on the Mapes Ranch (U. S. Fish and Wildlife Service, 1978a). While it appears that no rare or endangered species would be adversely affected by conversion of uncultivated areas to agricultural use, local populations of other species could be eliminated.

Public Health

Public health concerns associated with the irrigation reuse of effluent pertain to the potential for transmission of pathogens or other harmful substances to food crops or to groundwater bodies which provide drinking water supplies. Regulations on wastewater reuse practices are designed to eliminate public health risks associated with irrigation reuse projects. Compliance with these regulations entails a high level of effluent disinfection for irrigation of food crops as well as restrictions on the proximity of irrigated areas to domestic water wells. Most pathogens or toxic elements contained in effluent are retained by the soil, thus significantly lowering their concentration in the deeply percolating waters which recharge groundwater aquifers.

Crops currently grown on potential irrigation areas east of the San Joaquin River include corn, alfalfa, oats, barley, walnuts, safflower, sudan grass, clover, and irrigated pasture. All areas employ surface irrigation measures. The California Department of Health Services has no significant concerns with effluent reuse on these areas as long as established wastewater reclamation requirements (California Administrative Code, Title 22) are followed.

The West Stanislaus Irrigation District (WSID) is included as a reuse area in 5 of the 8 effluent distribution alternatives evaluated by the 1979 project report supplement. Surface irrigated food crops are grown extensively throughout the WSID, and spray irrigation of such crops has recently been started in some areas. Because of this and because oxidation pond effluent can be difficult to disinfect to required levels, the State Department of Health Services will require more detailed information on disinfection procedures prior to any reclamation permit involving lands in the WSID.

Sludge Disposal Impacts

Current sludge disposal practices consist of hauling dewatered sludge to agricultural sites for spreading as a soil conditioner and low-grade fertilizer. This procedure is presently conducted by a private fertilizer supply firm under a short-term agreement with the city. Several questions have been raised as to the long-term acceptability and viability of this sludge management procedure.

First, certain heavy metal constituents of Modesto sludge appear at sufficiently high concentrations to produce concern for contamination of soil at application sites. This concern is based on the possibility that plant toxicity could result from metal buildup through multiple applications in the soil or that certain metals could be absorbed by plants at levels which would be toxic to consumers.

Second, more stringent regulations over sludge application may be imposed by regulatory agencies in the near future. Such regulations would be directed toward eliminating environmental and public health hazards associated with sludge disposal. Greater restrictions over sludge application practices could effectively reduce the agricultural market for sludge reuse, thus necessitating the pursuit of other alternatives for disposal of Modesto sludge.

Third, the increasing volume of sludge which will be produced as Modesto grows may exceed the agricultural demand for sludge in the future.

A final determination of future sludge management policy will depend on further decisions by pertinent regulatory agencies. Future actions may involve: 1) implementation of a source control program to reduce heavy metal concentrations in sludge; 2) implementation of an alternative sludge management program such as landfilling; and 3) continuation of existing sludge management practices, if it is determined that metal concentrations fall within acceptable limits for agricultural use and that application practices meet public health standards.

Mitigation Measures

The primary purpose of NEPA is to ensure that federal agencies minimize the direct and indirect environmental impacts of projects they undertake or support. EPA is particularly concerned that its actions under one program (Clean Water Grants) do not interfere with other federal policies (protection of prime agricultural land) or other federal laws (the Clean Air Act).

As the applicant for federal and state grant funds, the City of Modesto has primary responsibility for project planning. Similarly, the City of Modesto has primary responsibility for determining which measure it will implement to avoid or mitigate direct and indirect impacts of that project. The adequacy of these measures will be a factor considered by EPA when a decision is made on the city's grant request.

Mitigation of Prime Farmland Impacts

Chapter 5 of this EIS presents an extensive discussion of various federal, state, and local agency actions which can be taken to reduce or compensate for the urbanization of prime farmlands. These are summarized in Table 1-4.

A review of historical data for the City of Modesto indicates that, since about 1970, city policies have resulted in a more compact pattern of development than previously had occurred. During preparation of this Final EIS, land use data were collected from all Central Valley cities having a population of at least 25,000. Among the 15 cities analyzed, Modesto ranks fourth in terms of gross population density, fifth in terms of residential land use density, and sixth in terms of utilization of developable land within city limits.

Following the public hearing on the Draft EIS, the Modesto City Council voted to adopt (or consider for future adoption) a series of measures designed to mitigate the prime farmland impacts discussed previously. These, and other measures implemented in recent years, are summarized in Table 1-5. The effectiveness of these measures in retaining farmland for agricultural uses is assessed in Table 1-6. EPA considers this package of measures to represent adequate mitigation of prime farmland impacts.

Mitigation of Air Quality Impacts

The locally developed nonattainment plan has been adopted, with several revisions, by the California Air Resources Board. The population growth rates assumed for the emission forecasts

Table 1-4

PRIME AGRICULTURAL LAND MITIGATION MATRIX

	MEASURE PROPOSED	IMPLEMENTATION			TYPE OF MEASURE[1]		ORIENTATION		APPROACH		WHEN IMPLEMENTABLE[2]		LIKELY EFFECTIVENESS		
		LOCAL	STATE	FEDERAL	REGULATION	INCENTIVE	URBAN	AGRICULTURAL	DIRECT	INDIRECT	SHORT RUN	LONG RUN	STRONG	SLIGHT	UNKNOWN
A	*Affect the amount of urban development*														
1	Limit the amount of land zoned for urban development	●			●		●		●		●		●		
2	Limit number of building permits issued	●			●		●		●		●				●
3	Limit industrial growth generators	●			●		●			●	●				●
B	*Affect the density of development*														
1	Low minimum lot sizes in urban areas	●				●	●		●		●				●
2	High minimum lot sizes in rural areas	●			●			●	●		●		●		
3	Maximum lot sizes in urban areas	●			●		●		●		●		●		
4	Minimum neighborhood densities in urban areas	●			●		●		●		●		●		
5	Infill development in urban areas	●			●	●	●		●		●		●		
6	Cluster development in urban areas	●				●	●		●		●				●
7	Cluster development in rural areas	●			●			●	●		●			●	
C	*Affect the location of urban development: control urban locations*														
1	Growth on or toward non-prime lands	●			●		●		●		●				●
2	Prohibition of subdivision on unincorporated lands	●			●		●		●		●		●		
3	Eligibility for housing programs		●	●	●	●	●			●		●			●
4	Eligibility for community development/redevelopment aid		●	●	●	●	●			●		●			●
5	New towns or satellite towns		●	●		●	●			●		●			●
6	Urban Strategy		●		●	●	●			●	●				●
	Affect the location of urban development: maintain agricultural locations														
7	General plans	●			●			●	●		●				●
8	Federal (and/or state) review of general plan elements		●	●	●			●	●		●				●
9	Agricultural reserves		●		●	●		●	●		●				●
10	State regulation of agricultural land		●		●			●	●			●			●
11	Federal designation of exclusive agricultural districts			●	●			●	●			●			●
12	Condemnation or transfer of development rights	●	●		●	●		●	●			●	●[3]		●[3]
13	Compensable regulation		●		●			●	●			●	●		
14	Outright purchase of prime agricultural land		●		●			●	●			●	●		
15	Purchase of remainder interest		●	●	●			●		●		●			●
D	*Limit the availability of urban infrastructure*														
1	Establish an urban service area for short-term growth	●			●		●		●		●		●		
2	Establish an urban expansion area for long-term growth	●			●		●		●		●		●		
3	EPA clean water grants		●	●	●		●			●	●				●
4	Restrict state and federal highway aid		●	●		●	●			●		●			●
5	Federal Regional Council coordination			●	●		●	●	●	●		●			●
E	*Promote agricultural uses*														
1	Bring new agricultural lands into production		●		●	●		●	●			●	●		
2	Put purchased agricultural land to agricultural use		●		●	●		●	●			●	●		
3	Growth of cooperatives		●	●		●		●		●		●		●	
4	New merchandising methods		●	●		●		●		●		●			●
5	Intermediate technology for agricultural production		●	●		●		●		●		●			●
6	National (and/or state) prime agricultural land policy		●	●	●	●		●	●		●				●
7	Assure adequacy of future water supplies (conservation, reclamation, new projects)		●	●		●		●		●		●			●
F	*Use tax policy to protect or encourage agricultural activity*														
1	Differential assessments for property tax purposes		●			●		●		●	●			●	
2	Defer taxation of agricultural lands		●			●		●		●	●				●
3	Apply value capture techniques to land benefiting from public investment	●	●			●		●		●		●			●
4	Finance agriculture with non-agriculturally derived capital			●		●		●		●		●			●
5	Alter tax rules for industrial investment		●	●		●		●		●		●			●
6	Restructure formula for distributing sales tax revenue	●	●			●	●			●		●			●
G	*Needed studies*														
1	Cost/benefit analysis of national prime agricultural land preservation			●							●				
2	Comparative inter-city analysis of prime agricultural land retention			●							●				
H	*Performance standards for local growth*														
1	Threshold conditions	●	●	●	●		●		●		●		●		
2	Conversion coefficients	●	●	●	●		●		●		●		●		

[1] The implementation of some measures could be accomplished via either regulation or incentive.

[2] Assumes feasibility. Assignment to a column reflects judgment of time needed to establish operation/administration. "Short run" includes state and federal measures already in effect.

[3] Condemnation strong; transfer unknown.

Source: Gruen Gruen + Associates

Table 1-5

MODESTO'S AGRICULTURAL LAND MITIGATION PROGRAM: IMPACT SUMMARY AND TIMETABLE FOR IMPLEMENTATION

New (July 1979) Measures	Effect on Amount of Land Needed	Effect on Location of Land Needed	Implementation Status: ● Adopted ○ Under Consideration
■ Amend *Urban Growth Policy* to contain a policy statement that all residential growth should be within the city.	Negligible.	Enforces continguity, reducing pressure for agricultural land conversion.	● Considered and approved by Modesto City Council, August 7, 1979.
■ Amend *Urban Growth Policy* to contain a goal of increasing city residential density to 7.0 units/net acre by 1985.	An increase from 6.6 to 7.0 du/net acre reduces land requirements by about 6 percent.	None.	● Considered and approved by Modesto City Council, August 7, 1979.
■ Revise *General Plan* to reduce extent of the urban reserve area on the east.	None.	Preserves approximately 1,045 acres of prime agricultural lands east of the Santa Fe Railroad for at least the next two decades.	○ Amendment and EIR to be prepared by February 1980; Planning Commission action anticipated April 1980; Council action, May 1980.
■ Expand and clarify priority list for trunk sewer extensions.	Negligible.	Channels growth toward and on non-prime soils; allows for development of 1,018 acres by year 2000 on non-prime soils that might otherwise have absorbed prime soils.	● Considered and approved by Modesto City Council, August 7, 1979.
■ Amend Zoning Ordinance to make the R-1 Zone a density zone.	Permits additional development on oversize lots in previously-developed R-1 Zones.[1]	Encourages infill; reduces urban demand for agricultural lands.	○ Amendment has been drafted Planning Commission action anticipated January 1980; Council action, February 1980.

Table 1-5 con't.

New (July 1979) Measures	Effect on Amount of Land Needed	Effect on Location of Land Needed	Implementation Status: ● Adopted ○ Under Consideration
■ Amend Zoning Ordinance to reduce the minimum lot size in R-1 and R-2 Zones to 5,000 square feet.	Change from 6,000 to 5,000 square feet allows a maximum reduction in land requirements of 16 percent.	Reduces urban demand for agricultural lands.	Amendment has been drafted; Planning Commission action anticipated January 1980; Council action, February 1980.
■ Amend Zoning Ordinance to add a maximum lot size to the R-1 Zone.	Maximum lot size of 10,000 square feet could reduce single-family subdivision land requirements by 5 percent.[2]	Reduces urban demand for agricultural lands.	○ Same.
Other Recent (1978-79) Measures			
■ Duplexes on corner lots in new subdivisions.	If fully realized, would reduce by 18 percent the land requirements of new single-family subdivisions.	Reduces urban demand for agricultural lands.	● In effect.
■ Permit small annexations in South Modesto; annex county enclaves; reduce concentration of subsidized housing.	None.	Encourages infill; reduces urban demand for agricultural lands.	● In effect.
Major Prior (1977 and Earlier) Measures			
■ P-D Zoning	If fully realized, could reduce land that would otherwise be absorbed by R-1 development by 37 percent.[3]	Encourages infill (especially by higher-density single-family structures) and reduces land requirements of new subdivisions.	● In effect.
■ Neighborhood prototype	At 75 percent buildout, allows for 38 percent higher density than 1976 levels.[4]	Reduces urban demand for agricultural lands.	● In effect.

[1] Impact cannot be quantified because the number of oversize lots is not known.

[2] Estimate based on 1977 subdivision data, assuming that lots in excess of 10,000 square feet average 15,000 square feet in area.

[3] Maximum R-1 density is 7¼ units/acre compared to 10 units/acre under P-D zoning, resulting in a potential decrease of 37 percent in land absorption.

[4] At a buildout of 75 percent of maximum allowable density, the prototype yields 6.825 units/gross acre compared to the 1976 city average of 4.95.

Source: Modesto Planning and Community Development Department and
Gruen Gruen + Associates.

Table 1-6

PRIME AGRICULTURAL ACREAGE RETAINED UNDER MODESTO'S MITIGATION PROGRAM

	1984 (Capacity of Initial Project)	1995 (Capacity of Full Project)	2000
Urban Land Needs			
Unmitigated[1]	1,370	5,770	8,050
Partly Mitigated (Existing Condition)[2]	1,095	4,615	6,440
With New Land Development Regulations[3]	1,065	4,295	5,980
Residential Land Needs			
Unmitigated[1]	870	4,010	5,700
Partly Mitigated (Existing Condition)[2]	695	3,210	4,560
With New Land Development Regulations[4]	665	2,890	4,100
Prime Agricultural Land Conversion			
Unmitigated[1]	1,025	4,480	6,650
Partly Mitigated (Existing Condition)[5]	820	3,585	5,320
With New Land Development Regulations[6]	790	3,275	4,860
Prime Agricultural Land Retained via Total Mitigation Program:			
Retention via New Land Development Regulations[7]	235	1,205	1,790
Retention via New Infrastructure Extension Priorities[8]	0	55	1,020
Total Acres Retained	235	1,260	2,810
Acres of Prime Agricultural Land Retained as Percent of Prime Agricultural Land Conversion in Unmitigated Condition	23%	28%	42%

[1] As discussed in the text, measures adopted in the 1970's have reduced agricultural land absorption by about 20 percent from what it would otherwise have been. Thus, acreage estimates for the unmitigated condition are those figures which, reduced by 20 percent, yield the estimate given for the partially mitigated condition.

[2] The EIS forecast, as presented in Table 5-7.

[3] Total acres required in partly mitigated condition (preceding row) minus change in residential acres required between partially mitigated condition and condition with new land development regulations.

[4] Residential land requirements under partial mitigation (preceding row) have been reduced by 1 percent for each elapsed year to 1990. That is, in 1981, required residential acres under new regulations are 1 percent less than under partial mitigation; in 1982, 2 percent less, and so forth. After 1990, a 10 percent reduction is maintained.

[5] The EIS forecast, as presented in Table 5-8.

[6] Deducts difference in residential land needs from agricultural land conversion in the partly mitigated condition.

[7] Agricultural land absorption in the unmitigated condition minus agricultural land absorption under new development regulations.

[8] Calculated from data presented in Table 5-14.

Source: Gruen Gruen + Associates

in that plan exceed those used for designing the proposed Modesto treatment plant expansion. Thus, processing of the city's grant request is expected to proceed even though a State Implementation Plan (SIP) revision for Stanislaus County has not yet been submitted to EPA by the Air Resources Board. Award of "Step 3" (actual construction grant) funding will be contingent on EPA approval of the SIP revision or development of project-specific air quality mitigation measures.

EPA approval of the SIP revision would preclude the need for any further project-specific air quality mitigation. EPA disapproval of the SIP revision may necessitate action by the city to develop and implement a project-related air quality mitigation program. Appendix K of this EIS contains a project-related air quality analysis which could serve as the basis for a project-specific air quality mitigation program if that becomes necessary.

Management Recommendations Related to Effluent Irrigation Practices

Soils and Crops. The following agricultural management practices may be used by land owners to minimize the risks of soil salinization, permeability reduction, and crop yield reductions due to irrigation with Modesto effluent: 1) maintenance of an adequate leaching fraction to prevent salt buildup in the rooting zone, 2) periodic application of gypsum to counteract the effects of sodium on the soil by improving soil permeability, 3) control of high water table levels, to reduce salinizing influences, 4) selection of crop types which are resistant to salinity and to specific ions present in high concentrations in effluent, and 5) mixing effluent with other irrigation water supplies of better quality, or alternating the use of effluent and freshwater sources.

Groundwater. Management practices which would reduce groundwater impacts include: 1) minimizing effluent applications at given sites, hence, maximizing the effluent distribution area; and 2) minimizing drainage volumes. Although the latter practice would appear to encourage salt buildup in the soil recent innovations in salinity management call for the achievement of highly concentrated drainage waters, which favor the precipitation of salts out of the percolating solution. Thus, both soil and groundwater quality may be managed compatibly.

To avoid potential hazards to domestic water supplies on farms, several precautions should be observed: 1) damaged or abandoned wells should be repaired or sealed; 2) effluent irrigation should not be carried out within 200 feet of domestic water supply wells; 3) periodic analysis of domestic water supplies for pathogenic or toxic indicators should be performed; 4) new wells should be constructed to tap only deeper aquifers, preferably below the confining clay layer, or the "E-clay".

Any wastewater reuse project will require a reclamation permit from the Regional Water Quality Control Board. This reclamation permit will be reviewed by the Department of Health Services and other concerned agencies.

Management Recommendations Related to Sludge Disposal

Modesto's wastewater treatment plant generates approximately 3,200 tons of air-dried sludge per year. Currently, this sludge is hauled by a fertilizer supply company to farms in Tulare County for application as a low-grade fertilizer and soil conditioner. The arrangement between the city and the supply company has been mutually beneficial; Modesto has been provided with a cost-free means for disposing of its air-dried sludge, and the supply company has had a free source of soil conditioner to distribute and sell to its customers. However, recent sludge analyses have indicated that Modesto's sludge contains trace elements which could contaminate soils, harm crops, and/or be absorbed by crops at levels unsafe for consumption. The extent to which these effects could materialize depends not only on the trace element concentrations in sludge but also on the sludge application rates and specific characteristics of the site, such as soil pH, cation exchange capacity, soil depth, and crop types. At present there is no regular program for monitoring either sludge constituents or effects at application sites. Furthermore, application rates are set at the discretion of the fertilizer company and the farmers, with no apparent concern for the potential harmful effects of sludge reuse.

In light of these considerations, the city should consider taking the following steps to reduce the possibility for adverse environmental impacts resulting from sludge applications to cropland:

1. Sludge analyses for cadmium, chromium, copper, lead, nickel, and zinc should be carried out quarterly on a composite sample obtained from all drying beds. At least one sample per year should be analyzed for arsenic, cobalt, manganese, mercury, molybdenum, selenium, and vanadium. These results should be periodically evaluated for their significance to agricultural reuse, and pronounced variations in the level of any element should be noted.

2. An information pamphlet on Modesto sludge should be prepared for distribution to sludge users. This pamphlet should include the results of the four most recent quarterly analyses. Guidelines for application rates and site selection and management should also be discussed. The potential hazards to soils and crops which could result from improper site management should be clarified. In general, application rates should not exceed two dry tons per acre per year, although specific site conditions may necessitate lower rates. For this application rate to be used, soils should have a cation exchange capacity of 15 or more and a pH of 6.5 or more. Sites should be sufficiently level to prevent surface runoff, preferably with slopes of less than 5 percent. A list of names and addresses of farmers using sludge should be maintained by the city or sludge supply company for use in the event that further communication is required.

3. A program should be developed for identifying the major discharge sources of lead, chromium, and other toxic metals which may appear in excess in the sludge. Major dischargers should be required to reduce the levels of these elements in their discharges to municipal sewer lines.

4. Alternative sludge management procedures should be developed by the city in order to prepare for the possibility that agricultural reuse becomes infeasible or that the agricultural market cannot absorb the total volume of sludge production.

Mitigation of Fish and Wildlife Impacts

Most of the potential impacts on fish and wildlife are essentially unavoidable consequences of the basic project design. Wildlife habitat lost from construction of the proposed storage ponds could only be replaced by converting agricultural land to a wildlife habitat area.

If the Mapes Ranch is selected as an effluent reuse area, construction of effluent distribution pipelines in that area should be scheduled for the March to October period. This will minimize disturbance of the endangered Aleutian Canada goose wintering area.

Implications of the No-Project Alternative

Effects on Area Growth Dynamics and Funding

A decision by the City of Modesto not to proceed with any of the proposed facility improvements would greatly constrain future development in Modesto. Inadequate facility capacity could result in the city's imposing a moratorium on new connections to the system. Even if the city did not take such action, the present facility would continue to violate the discharge requirements established by the Regional Water Quality Control Board (RWQCB). Continued violation could lead the RWQCB to impose fines or a ban on new connections to Modesto's sewer system.

If Federal funding is not provided for the proposed project, it is likely that the city would finance some facility improvements on its own. The city has already approved two major interceptor projects (the West Trunk and Dryden interceptors) which will necessitate construction of a new pump station. While the city has not thoroughly evaluated its options for such a situation, available funds would probably be used for improvements at the primary plant. Pump station and sludge handling facilities would probably take priority. It is unlikely that the city could finance the required storage pond and pipeline facilities for irrigation reuse of the effluent; thus, river discharge (with some effluent reuse on the Chase property) would continue (Campbell, pers. comm.). Discharge requirements would continue to be violated. The city would then face the prospect of RWQCB-imposed fines and/or a connection ban. If the canning industries removed their discharges to the city system (by providing their own treatment or irrigation systems), the city might be able to meet discharge requirements; this possibility, however, is by no means certain.

Urbanization of Agricultural Lands

Since area growth would be greatly constrained due to a possible ban on new connections to the Modesto sewer system, the rate and amount of urbanization of agricultural lands would be proportionately decreased. It is likely, however, that new housing units not built in Modesto because of the ban would be built elsewhere in Stanislaus County, thus neutralizing the savings of prime lands. To the extent that displaced units were built in large-lot, ranchette developments, they would have a more severe adverse impact on agriculture than units built at urban densities in or around Modesto.

Water Quality Implications

Failure to undertake any facility improvement would result in a continuing discharge of effluent which regularly exceeds discharge requirements for BOD, suspended solids, residual chlorine, and bacterial levels, and which occasionally exceeds standards for oil and grease, pH and toxicity. Current impacts on river water quality and fisheries would be continued.

Air Quality Implications

Under no project conditions it is likely that future development in the Modesto area would be strongly curtailed. As a consequence, pollutant emissions associated with currently projected growth levels would not occur. Some shift of development pressures to surrounding communities might occur, but it is unlikely that any one community would absorb all of the development currently projected for Modesto. Displacement of development pressures to the Stockton area would result in some impacts on ozone levels in Modesto since pollutant transport appears to take place between Stockton and Modesto.

Chapter 2

PURPOSE AND NEED FOR THE PROJECT

Locational Setting

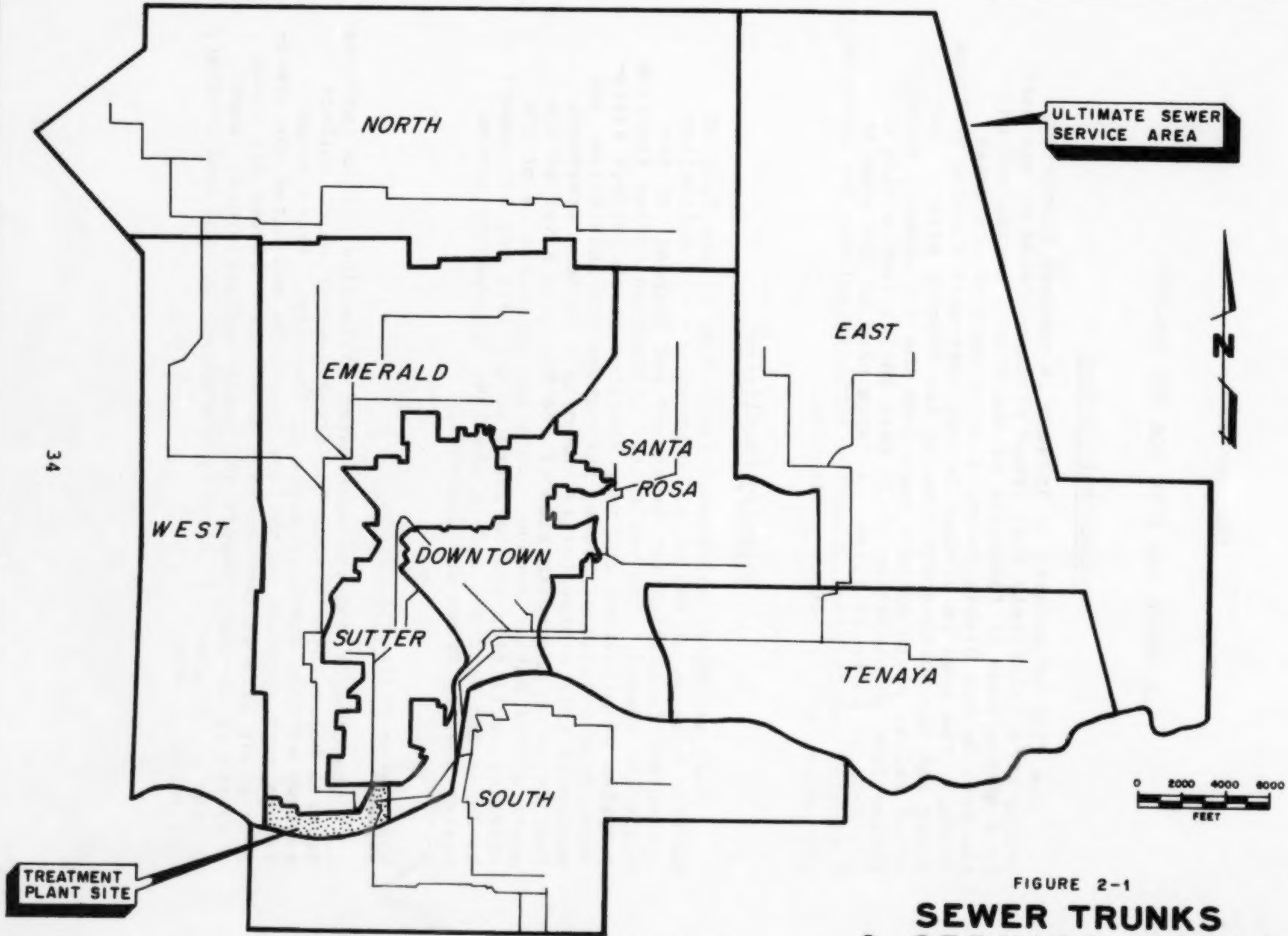
The City of Modesto is located in eastern Stanislaus County on a relatively flat broad plain bordered on the east by a narrow band of foothills of the Sierra Nevada and on the west by the Diablo Range, a major unit of the Coast Ranges. The area is drained by the east-west flowing Tuolumne River and the north-south flowing San Joaquin River. The broad valley plain extends east from the San Joaquin River, rising from an elevation of 35 feet to 175 feet within a distance of 15 to 20 miles. A large part of the area is irrigated and receives intensive agricultural use for orchards, row crops, and livestock production.

Existing Facilities

The wastewater management facilities of the City of Modesto consist of two major components - - a collection system and facilities for treatment and disposal of the collected sewage. The wastewater collection system involves a system of pipelines and pump stations which collect wastewater from individual homes, businesses and industries, and transport this wastewater to the city's primary treatment facilities on the north side of the Tuolumne River at the south end of Sutter Avenue. Detailed descriptions of the existing facilities can be found in the 1976 project report by Jenks and Harrison and in the 1966 interceptor system master plan by Brown and Caldwell.

Wastewater Collection System

The City of Modesto wastewater collection system involves several major interceptors (or trunk sewers) which collect wastewater from specific areas of the city. These trunk sewers join together at various locations and enter the treatment plant site at two separate locations. Figure 2-1 shows existing major trunk sewers and their service areas. Some of the older areas of the city are served by combined sanitary and storm sewers.


NORTH
ULTIMATE SEWER SERVICE AREA
EAST
N
EMERALD
SANTA ROSA
WEST
DOWNTOWN
SUTTER
TENAYA
SOUTH
0 2000 4000 6000
FEET
TREATMENT PLANT SITE

DATA SOURCE: BROWN & CALDWELL, 1966 & J.B. GILBERT & ASSOCIATES, 1976

FIGURE 2-1

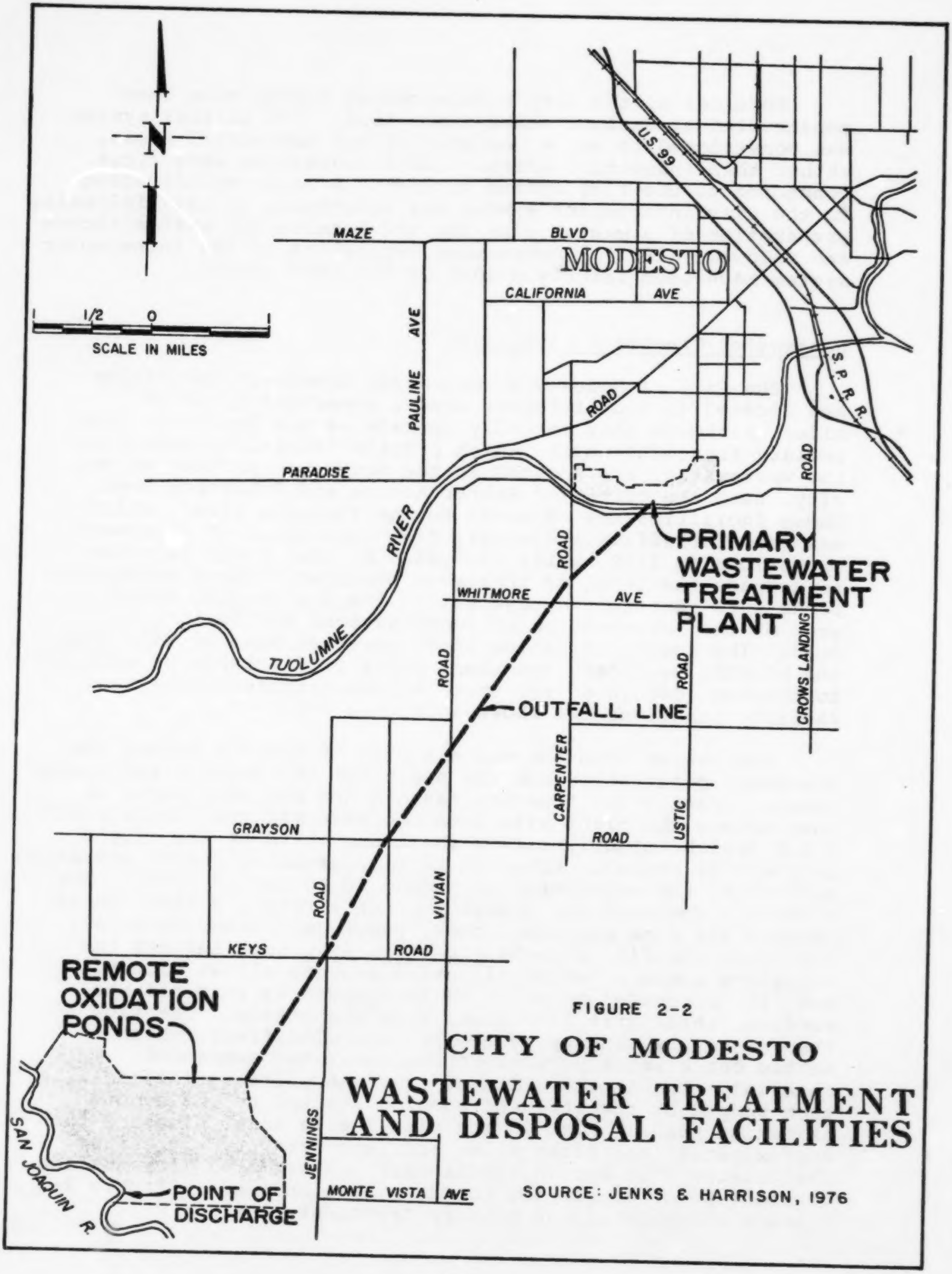
SEWER TRUNKS & SERVICE AREAS

Portions of the city's interceptor system have been constructed at various times since 1910. The initial system was constructed to serve residential and commercial areas, rather than industrial areas. Local industries were first connected to the city system in 1949. A major modification to the city interceptor system was undertaken in 1967 following preparation of a master plan for the interceptor system (Brown and Caldwell, 1966). Subsequent expansions of the interceptor system have been largely guided by the 1966 plan.

Wastewater Treatment Facilities

The City of Modesto's wastewater treatment facilities are located in two different areas, separated by about 7 miles, although they actually operate as one facility. The primary treatment units, which provide initial treatment to the wastewater, are located in the southwest portion of the city, near the corner of Sutter Avenue and Robertson Road. These facilities are adjacent to the Tuolumne River, which was used for effluent disposal from initiation of treatment operations in 1910, until 1967-68. At that time, in order to upgrade the level of treatment provided, remote oxidation ponds were constructed adjacent to the San Joaquin River, west of the intersection of Jennings Road and Taylor Road. The remote oxidation ponds cover an area of 843 acres, and provide secondary treatment prior to discharge of effluent to the San Joaquin River, or to adjacent agricultural land. Facility locations are shown in Figure 2-2.

Wastewater from the western part of Modesto enters the treatment plant site from the north via the Emerald and Sutter trunks. Wastewater from the eastern and southern parts of town enters the plant site from the east via the "Industrial" Trunk (which actually serves about one third of the city's residential areas). After an initial grinding and/or screening operation, the wastewater is pumped up to ground level. The flows are combined and passed through a rotary screen, which removes the fine suspended rags, paper, and other material. Following the fine screens, the flow is passed through the vacuators where a vacuum flotation process allows flotable and fine suspended material to be removed as scum off the surface, while grit is removed from the bottom. The flow then passes by gravity to the primary clarifiers, which settle out a large portion of the remaining suspended material. The liquid effluent from the primary clarifiers is then pumped by the effluent pumping station to the remote oxidation ponds. Flow in the pipeline is under pressure for approximately the first mile, and is by gravity thereafter. The primary effluent is occasionally chlorinated (for sulfide control) prior to pumping to the oxidation ponds. Figure 2-3 shows the layout of the primary treatment plant.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SCALE IN MILES
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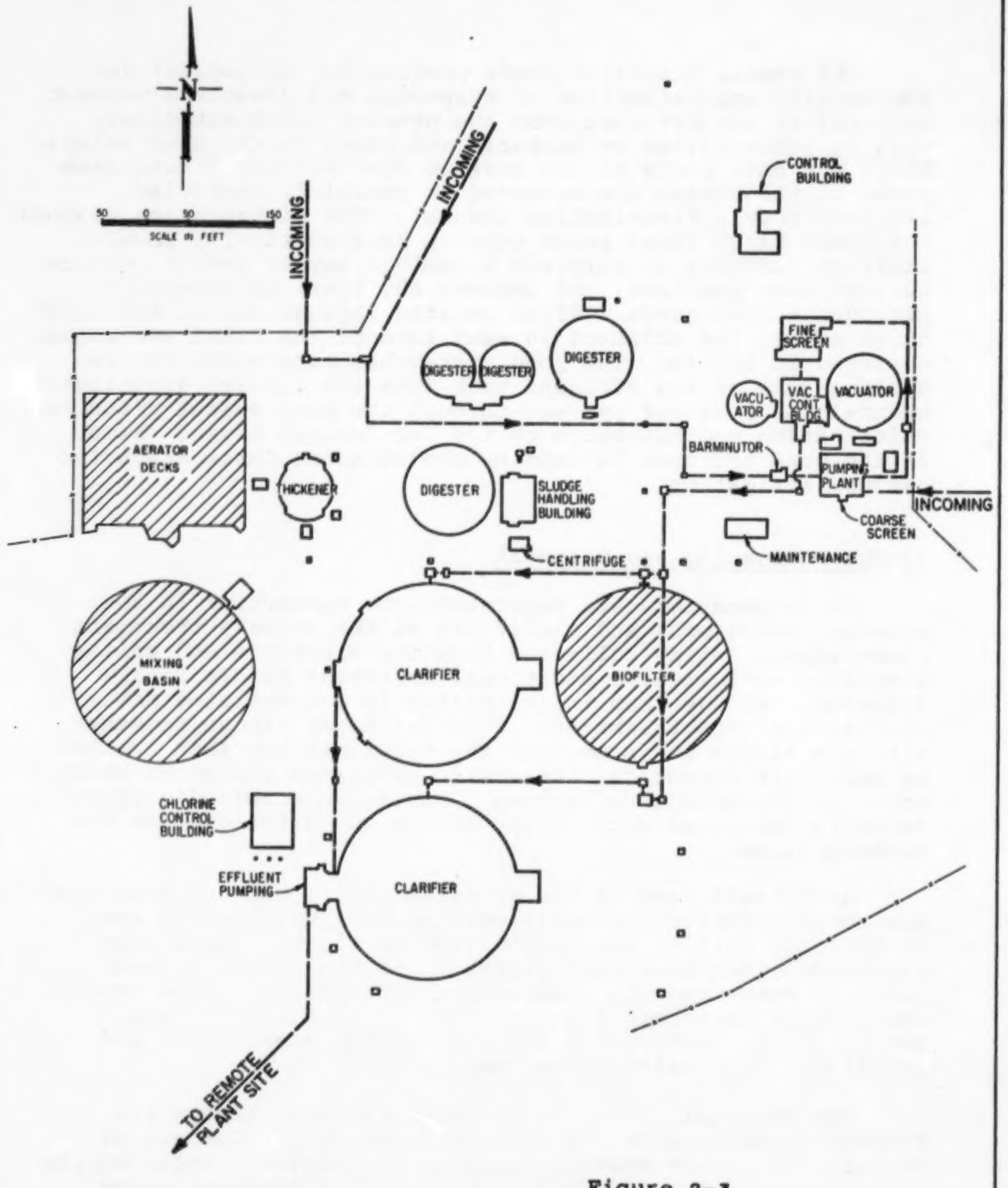
S.P.R.R.
ROAD
PARADISE
ROAD
TUOLUMNE
RIVER
PRIMARY
WASTEWATER
TREATMENT
PLANT
WHITMORE
AVE
ROAD
ROAD
CROWS LANDING
ROAD
OUTFALL LINE
CARPENTER
GRAYSON
ROAD
USTIC
ROAD
VIVIAN
KEYS
ROAD
REMOTE
OXIDATION
PONDS
JENNINGS
SAN JOAQUIN R.
POINT OF
DISCHARGE
MONTE VISTA
AVE

FIGURE 2-2

CITY OF MODESTO

WASTEWATER TREATMENT AND DISPOSAL FACILITIES

SOURCE: JENKS & HARRISON, 1976


N
50 0 50 150
SCALE IN FEET
INCOMING
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BARMINUTOR
PUMPING PLANT
INCOMING
COARSE SCREEN
AERATOR DECKS
THICKENER
DIGESTER
SLUDGE HANDLING BUILDING
MAINTENANCE
CENTRIFUGE
MIXING BASIN
CLARIFIER
BIOFILTER
CHLORINE CONTROL BUILDING
EFFLUENT PUMPING
CLARIFIER
TO REMOTE PLANT SITE

LEGEND

☐ PLANT UNITS IN USE

▨ PLANT UNITS NOT IN USE

Figure 2-3

CITY OF MODESTO
LOCAL WASTEWATER TREATMENT FACILITIES

SOURCE: JENKS & HARRISON, 1976

The remote oxidation ponds provide for biological decomposition and metabolism of suspended and dissolved organic material in the effluent from the primary treatment plant. This is accomplished by bacteria and algae in the pond waters. There are five ponds in the Modesto system. The first three ponds in the system are operated in parallel, receiving effluent from a distribution channel. The distribution channel and these first three ponds contain 76 electrically powered floating aerators to maintain dissolved oxygen levels, reduce current odor problems, and improve the level of treatment provided by the ponds. After passing through one of the first three ponds, the effluent is sent through the final two ponds, operated in series. The pond system has provisions for recycling some of the effluent back into the initial distribution channel for a second passage through the pond system prior to chlorination and discharge to the San Joaquin River. Some of the pond effluent is used by the adjacent Chase Ranch for pasture irrigation.

Sludge Processing and Disposal

Solid materials are separated from wastewater in the screens, vacuators, and clarifiers at the primary treatment plant site. Solids collected from the vacuators and primary clarifier must receive additional treatment before final disposal. Sludge from the clarifier is concentrated somewhat in a sludge thickener. This thickened sludge together with the sludge and scum from the vacuators are then treated by anaerobic digestion. Anaerobic processes are those which occur in the absence of oxygen. During anaerobic digestion, bacteria decompose much of the sludge to carbon dioxide and methane gases.

At present some of the digester gas is used to heat the anaerobic digester contents; most of the remainder is used as fuel for part of the city's vehicle fleet. The sludge remaining after anaerobic digestion is then dried on sand beds. A centrifuge is available for additional water removal between the anaerobic digester and the sand drying beds, but is rarely used due to its high energy consumption and relatively high maintenance requirements.

Approximately 2,000 cubic yards of dried sludge are removed annually from the beds by Hager Supply Company of Porterville, at no cost to the City of Modesto. Hager Supply then processes the sludge and sells it for application to agricultural land. Most of the sludge from the Modesto plant is currently used on citrus crops in Tulare County (Jenks and Harrison, 1978b).

Capacity of the Existing Facilities

The various components of Modesto's wastewater collection and treatment system differ in the amount of sewage they are able to accommodate. Several factors contribute to these differences. Some differences result from the fact that various components of the system were designed and installed at different times to meet changing needs. The effective capacity of some treatment units has been altered by requirements that more stringent levels of treatment be attained than was necessary when the equipment was first installed. Some of the variation is due to the seasonally changing nature of the wastewater which must be treated. Waste loads from local canneries and food processing plants are quite different from the sewage generated by residential and commercial areas. Two separate aspects of wastewater are considered in designing wastewater treatment facilities: expected flow variations and the amount of organic and other waste components in the sewage. Some treatment units are designed primarily to meet hydraulic flow criteria, while others must be designed to meet organic and other waste loads. Discussions of treatment plant capacity, however, are generally phrased only in terms of hydraulic flow. Even for units which are designed primarily on the basis of flows, different aspects of flow variations are used. For example, pumping units are rated in terms of the "peak hourly flow". This is done because the pumps must be capable of handling the instantaneous flow delivered to them, rather than "average" flow. On the other hand, biological processes are rated according to the "average daily flow", as they respond to flow changes rather slowly.

Table 2-1 identifies the design parameters and estimated effective capacities of major wastewater processing units of the primary treatment plant. Most units of a primary treatment facility are designed to accommodate expected peak hour flows. But actual sewage flows will vary by time of day (Figure 2-4) and by season (Figure 2-5). Thus, the realistic capacity of these facilities is significantly less than 24 times the 1-hour flow capacity of facilities. From Table 2-1 it is clear that the existing influent pumps are a determining factor in the effective capacity of the overall treatment plant. The combined capacity of the existing pumping plant is 43.9 MGD (million gallons per day), on a peak month. average daily flow basis. The primary effluent pumping plant also poses a capacity constraint. If one of the main 200 hp (horsepower) pumps should fail during the canning season, the only backup unit would be a 100 hp pump. This would reduce pumping capacity from 44.1 MGD to 33.8 MGD, a value less than average August and September flows.

Table 2-1

EXISTING CAPACITIES OF WASTEWATER TREATMENT UNITS, PRIMARY PLANT SITE

Unit Process	Function	Capacity in Terms of Design Parameters	Effective Capacity, Peak Month Average Daily Flow, in MGD
Headworks for Emerald and Sutter Trunks:			
Barminutor	Grinding	1.25 MG/HR, Peak Hour Flow	21.0 MGD
Upper level influent pumps	Lifting of raw wastewater	0.83 MG/HR, Peak Hour Flow	14.0 MGD
Headworks for Industrial Trunk:			
Bar screens	Removal of large floating material	2.5 MG/HR, Peak Hour Flow	44.8 MGD
Lower level influent pumps	Lifting of raw wastewater	1.67 MG/HR, Peak Hour Flow	29.9 MGD
Combined Flow Rotary Fine Screens	Removal of small suspended solids	2.92 MG/HR, Peak Hour Flow	51.5 MGD
Vacuators	Floatation removal of fine suspended and floatable solids	45 MGD, Peak Month Average Daily Flow	45 MGD
Primary Clarifiers	Sedimentation of heavy organic materials	44.6 MGD, Peak Month Average Daily Flow	44.6 MGD*
Primary Effluent Pumping Plant	Deliver primary effluent to remote oxidation ponds	2.5 MG/HR, Peak Hour Flow (1.92 MG/HR with one unit on standby)	44.1 MGD (33.2 MGD with one unit on standby)

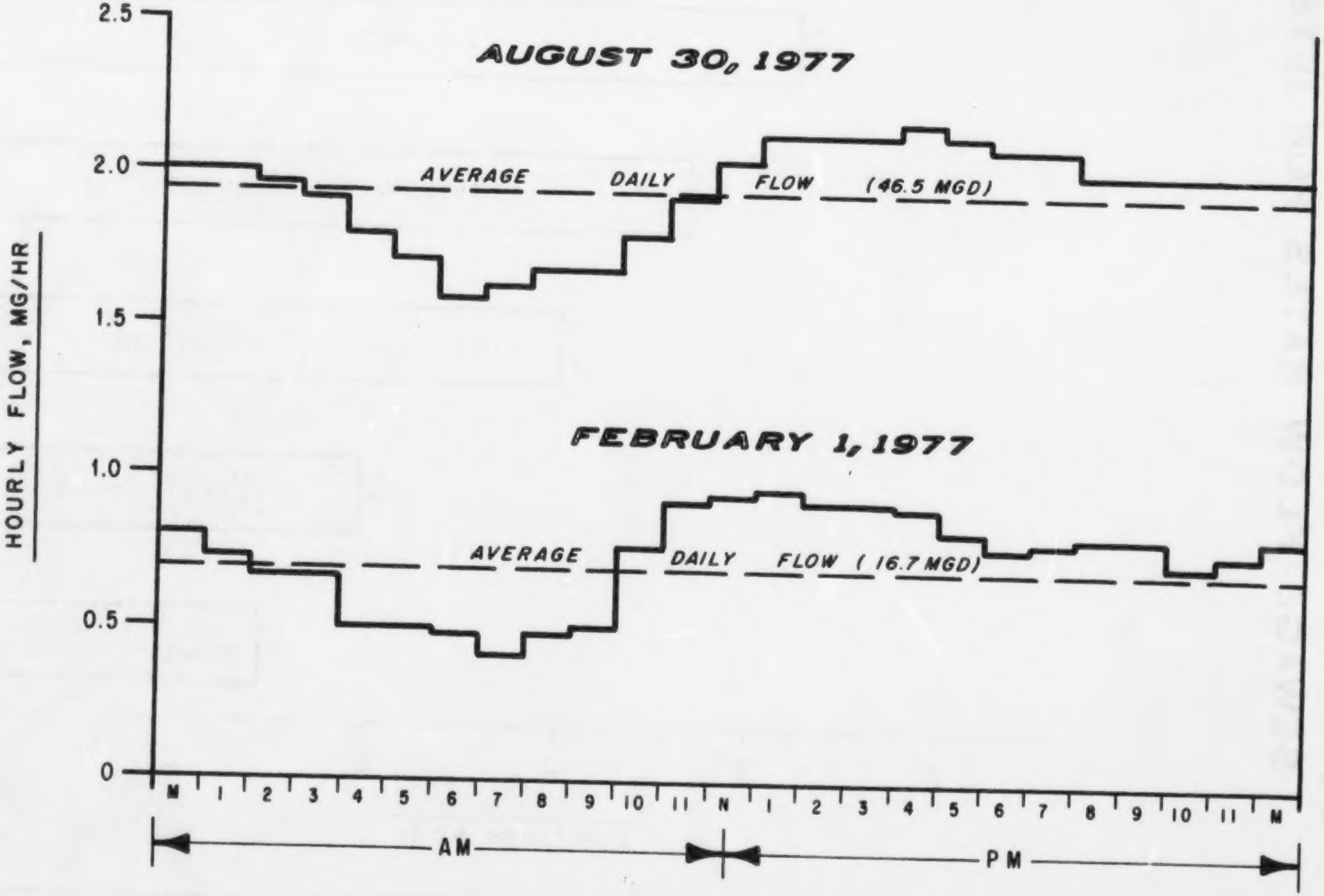
NOTES AND SOURCES: MG/HR = Million gallons per hour; MGD = Million gallons per day. Design capacities based on data in Jenks and Harrison, 1976; J. B. Gilbert and Associates, 1976; and discussions with staff of the city public works department.

"Effective capacity" is the peak month average daily flow (in MGD) associated with the design capacity flow. Effective capacity was calculated using peaking factors derived form 1975 flow data in Table IV-5 of Jenks and Harrison, 1976. Flows in the Emerald and Sutter trunks exhibit a peaking factor (24 x peak hour flow:peak month average daily flow) estimated at 1.43, while the peaking factor for the industrial trunk is estimated at 1.34. The Emerald/Sutter trunks are assumed to carry 57 percent of the domestic flow, 50 percent of the nonseasonal industrial flow, and 5 percent of the seasonal industry flow. The peaking factor for the city's total wastewater flow is 1.36.

*Nominal capacity based on data in Jenks and Harrison, 1976. Actual effective capacity appears to be almost 60 MGD; see discussion in Chapter 3.

FIGURE 2-4

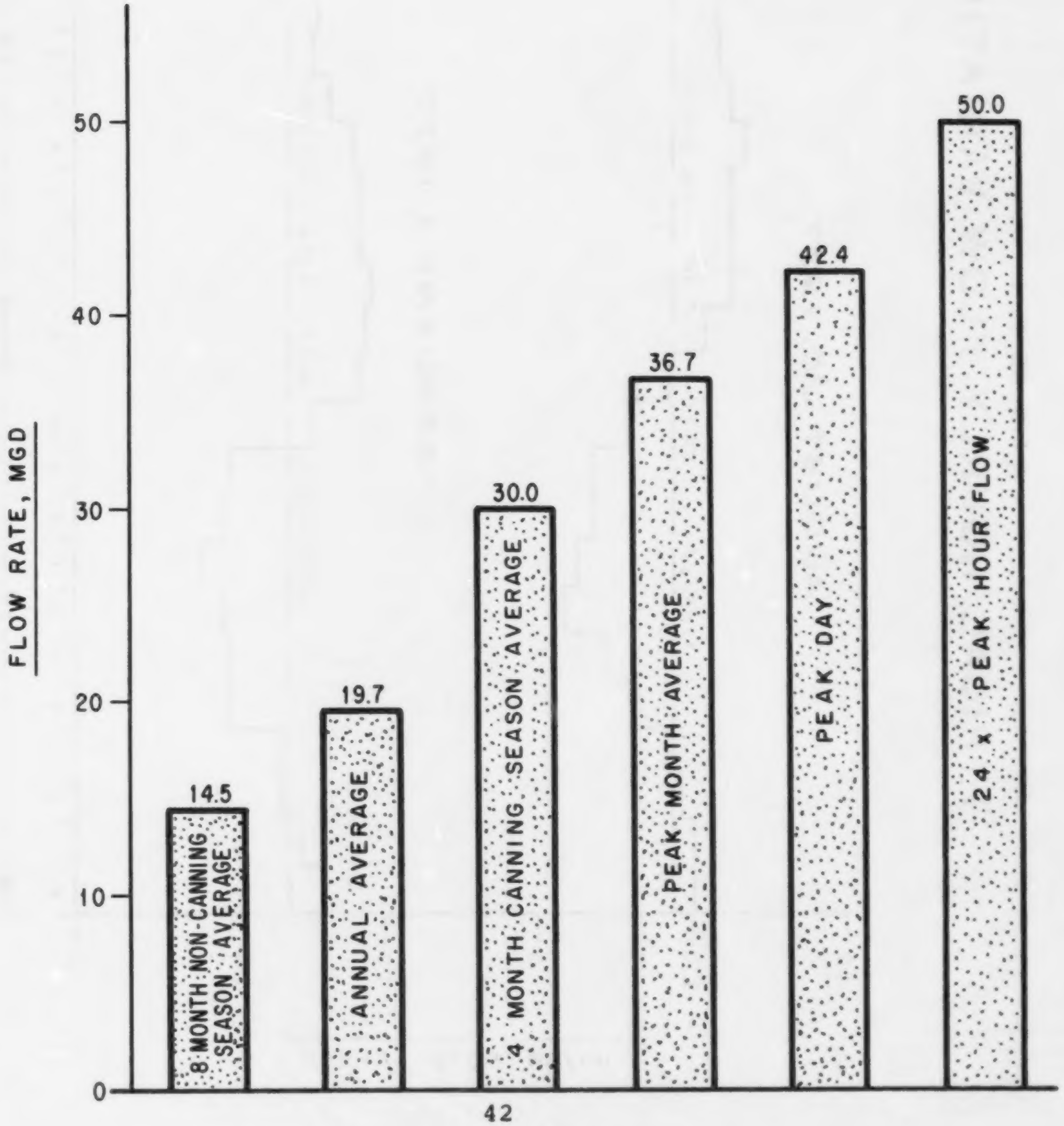
TYPICAL HOURLY FLOW VARIATIONS



DATA SOURCE: City of Modesto Public Works Department

FIGURE 2-5

COMPARISION OF SEASONAL & PEAK SEWAGE FLOW RATES FOR 1975



DATA SOURCE: JENKS & HARRISON, 1976

Facility Problems

The existing treatment facilities are unable to meet the requirements of the city's permit for discharging treated effluent to the San Joaquin River. Table 2-2 summarizes the current discharge requirements and the frequency with which they were violated in 1977. Factors contributing to these water quality problems as well as other problem areas at the existing facilities are identified below.

Raw Wastewater Influent Pumping

The existing upper level pump station receives wastewater flows from areas north and west of downtown Modesto. Winter peak flows from these areas are approaching the capacity of both the trunk sewers and the upper level pump station. Wastewater flows handled by the existing lower level pump station originate from the downtown, southern and eastern parts of the city, and include most of the industrial discharges. Peak flows, due largely to local canneries, equal or exceed the capacity of both the industrial trunk and the lower level pump station.

Sludge Thickener

The existing sludge thickener is a converted clarifier. During the canning season, this facility is so overloaded that it provides little thickening of the clarifier sludge. The thickener has insufficient capacity to accept solids from the vacuators. Odor problems at the primary plant site are generally attributed to poor thickener operation. Operational problems with the anaerobic digesters are also due in part to lack of adequate sludge thickening.

Sludge Digesters

The existing anaerobic sludge digesters do not have sufficient capacity to handle sludge loads during the canning season. The City of Modesto currently requires suspended solids and grit removal pretreatment at food processing industries.

Sludge Drying Beds

The existing sludge drying beds do not have sufficient capacity to meet future needs.

Table 2-2

SUMMARY OF 1977 DISCHARGE PERMIT VIOLATIONS

Effluent Limitation	Month (X indicates violation)											
	J	F	M	A	M	J	J	A	S	O	N	D
Total coliform Organisms, MPN/100 ml												
30-day average, 23 median	X						X		X	X	X	X
Daily Maximum, 500	X				X			X	X	X	X	X
Dissolved oxygen in oxidation ponds, >1.0 mg/l, 16 hrs/day						X		X	X	X	X	X
BOD												
30-day average, 30 mg/l	X	X			X	X	X	X	X	X	X	X
7-day average, 45 mg/l											X	
Daily Maximum, 90 mg/l								X	X	X	X	
Total Suspended Matter												
30-day average, 30 mg/l	X	X	X	X	X	X	X	X	X	X	X	X
7-day average, 45 mg/l	X	X	X	X							X	X
Daily Maximum, 90 mg/l		X		X		X	X	X	X	X	X	
Oil and Grease												
30-day average, 10 mg/l								X	X			
Daily Maximum, 15 mg/l							X	X	X			
Chlorine Residual; Daily Maximum (<0.1 mg/l)	X	X	X	X	X	X	X	X	X	X	X	X
Bioassay - fish survival[1]	-	-	X	X	X	X			X			
pH, must be between 6.5 and 8.5					X	X	X		X			

[1] 96-hour bioassay in undiluted effluent, minimum survival shall be no less than 70% while the median of three or more consecutive bioassays should be no less than 90%.

SOURCE: J. B. Gilbert, 1978

Primary Effluent Pumping

Effluent from the primary clarifiers is pumped to the remote oxidation ponds using three of four pumps housed on the primary plant site. The design of the outfall to the oxidation ponds does not permit simultaneous use of all four pumps. Three of the existing pumps are rated at 200 hp, while the fourth pump is rated at 100 hp. All three 200 hp pumps must be operating to meet peak flow pumping demands.

Building Space

Expansion of the number of employees required to run the treatment facilities, from 14 in 1968 to 22 in 1978, has cramped the existing operations and laboratory facilities. Space is insufficient for employee locker room and day room facilities, and a separate storage area is needed for flammable solvents. Also, recently expanded water quality monitoring and reporting requirements will require additional laboratory space and personnel. It is estimated that a minimum of a 50 percent increase in floor area is required.

Remote Oxidation Ponds

At the ponds, many of the existing problems are due to the inefficient removals presently being accomplished by the primary plant. The existing 76 floating aerators are not able to maintain dissolved oxygen at the required levels during the canning season. In addition, the presently utilized chlorine contact basin is not baffled and provides relatively inefficient contact, with resultant poor disinfection in spite of high chlorine dosages used. Since much of the chlorine remains unused and is discharged in the plant effluent, the discharge requirement is frequently violated. No provisions are presently available for de-chlorination prior to discharge.

Project Objectives

In January 1975 the City of Modesto retained the engineering firm of Jenks and Harrison to identify and evaluate alternative treatment plant improvement programs.

As outlined in the August 1976 Project Report (Jenks and Harrison, 1976), the objectives and goals of the planning effort for these facilities were:

To provide a means of meeting immediate, near-term waste discharge requirements.

To evaluate alternative means within the framework of monetary and nonmonetary considerations, including environmental considerations.

To be responsive to state and federal objectives and recommendations, as set forth in the "Basin Plan".

To anticipate future changes in discharge requirements and water quality objectives.

To facilitate meeting of both immediate and long-range goals for wastewater reclamation for beneficial reuse, taking into full consideration established State Health Department wastewater reuse requirements.

Chapter 3

PROJECT DESCRIPTION

Introduction

Planning for the City of Modesto project has been undertaken in two major stages. Initial planning and analysis focused on facility improvements at the primary treatment plant site and the separate oxidation ponds. Alternatives for resolving facility problems at the primary plant site and the oxidation ponds are described in the 1976 project report prepared by Jenks and Harrison. Based on preliminary analyses, a decision was made to actively pursue irrigation reuse of the treated effluent as an alternative to the current practice of discharging the treated effluent to the San Joaquin River. Alternative irrigation areas and distribution systems have been evaluated in a 1978 draft supplement to the project report. A slightly revised supplement to the project report was released in February 1979. This EIS has relied on these documents for a basic identification and analysis of project alternatives. The scope of alternatives evaluated in the project report and its supplement is sufficiently broad that no additional alternatives were developed for analysis in this EIS.

Table 3-1 provides a summary of the various alternative projects which have been considered by the City of Modesto, including cost estimates presented in the 1976 and 1978 project report documents mentioned above. The 1979 project report supplement recommended deleting some previously proposed elements at the primary plant site (electrical generators fueled by digester gas and removal of certain abandoned structures) while adding other items at both the primary plant site (additional sludge drying beds) and oxidation pond site (additional floating aerators and improved chlorination/ dechlorination facilities). The 1979 project report supplement presented revised and updated capital cost estimates for only one irrigation alternative (4B in Table 3-1). These updated costs are presented in Table 3-2.

The City of Modesto has requested and is receiving expedited action on a portion of the proposed project. It is expected that "Step 2" (design specifications) funding for the sludge thickeners, sludge digester, and oxidation pond aerators will be authorized in the near future. These facilities do not by themselves increase wastewater treatment capacity, but will provide water quality improvement and odor reduction benefits.

Table 3-1

SUMMARY AND COMPARISON OF VIABLE PROJECT ALTERNATIVES

Alternative	Project Report Designation	Description	Capital Cost	O&M Cost	Present Worth Cost[a]
RIVER DISCHARGE ALTERNATIVES					
1	A_s	New Activated Sludge Plant at Primary Plant Site	$26,580,000	$ 817,000	$ 35,277,000
2	B_s	Activated Biofilter Plus Aeration Tanks at Primary Plant Site	20,880,000	598,000	27,247,000
3	Abo+ Aar	Additional Ponds at the Secondary Plant Site and Algae Removal by Dissolved Air Flotation (DAF)	17,112,000	1,050,000	28,117,000
4	Abo+ Bar	Additional Ponds at the Secondary Plant Site and Algae Removal by Intermittant Sand Filters (ISF)	19,712,000	481,000	24,796,000
5	Bbo+ Aar	Existing Ponds at Secondary Plant Site, Biological Filters and Algae Removal by DAF	15,517,000	980,000	25,892,000
6	Bbo+ Bar	Existing Ponds at Secondary Plant Site, Biological Filters and Algae Removal by ISF	18,117,000	421,000	22,571,000
7	Cbo+ Aar	Existing Ponds at Secondary Plant Site, Additional Floating Aerators and Algae Removal by DAF	9,487,000	1,080,000	20,913,000
8	Cbo+ Bar	Existing Ponds at Secondary Plant Site, Additional Floating Aerators and Algae Removal by ISF	12,087,000	521,000	17,592,000
LAND APPLICATION ALTERNATIVES[b]					
1	A_1	Additional Ponds at Secondary Plant Site for Evaporation and Percolation	16,230,000	219,000	18,584,000

Table 3-1 (continued)

Alternative	Project Report Designation	Description	Capital Cost	O&M Cost	Present Worth Cost[a]
2	B_1	Upgraded Existing Ponds at Secondary Plant Site and Irrigation on City-owned Land	$ 17,517,000	$ 83,000	$ 18,384,000
3	$B_{1(b)}$	Upgraded Existing Ponds at Secondary Plant Site and Irrigation on City-owned Lands and River Disposal	13,647,000	373,000	17,592,000
4A	—	Upgraded and Additional Ponds at Secondary Site and Distribution to Chase, WSID	11,228,000	460,000	16,086,000
4B	—	Upgraded and Additional Ponds and Distribution to Chase, WSID and Gomes	11,116,000	458,000	15,956,000
4C	—	Upgraded and Additional Ponds and Distribution to Chase, WSID, Gomes and Ott	11,332,000	456,000	16,151,000
4D	—	Upgraded and Additional Ponds and Distribution to Chase, WSID, Gomes, Roger and Souza	11,631,000	452,000	16,424,000
4E	—	Upgraded and Additional Ponds and Distribution to Chase and Mapes	12,216,000	409,000	16,532,000
4F	—	Upgraded and Additional Ponds and Distribution to Chase, Mapes and Gomes	12,120,000	431,000	16,665,000
4G	—	Upgraded and Additional Ponds and Distribution to Chase, Mapes, Gomes and Ott	11,583,000	426,000	16,578,000
4H	—	Upgraded and Additional Ponds and Distribution to Chase, Wagler, WSID and Gomes	11,508,000	458,000	16,344,000

[a] Present worth equals the sum of construction costs plus annual operation and maintenance (O&M) costs for a period of 20 years discounted to present value of 7%.

[b] Based on data contained in the Supplement to the Project Report using the lowest cost effluent storage alternative which involves discharging about 19% of annual effluent flow into the San Joaquin River.

NOTE: Cost estimates for land application alternative 4A-4H are based on more recent data than that used for other alternatives, and thus are not strictly comparable to cost estimates for river discharge alternatives.

SOURCES:

Jenks & Harrison, 1976; 1978a.
J. B. Gilbert & Associates, 1976; 1978.

Table 3-2

ESTIMATED CAPITAL COSTS FOR THE LOWEST COST IRRIGATION ALTERNATIVE

Item	Cost
Influent Pumping Plant	$ 1,136,000
Booster Pumping Plant	491,000
Sludge Thickeners	1,214,000
Primary Digester	1,259,000
Existing Control Building Enlargement	97,000
Miscellaneous Improvements	65,000
Additional Floating Aerators	525,000
Chlorination Facilities Improvements/Dechlorination	290,000
Additional Sludge Drying Beds	300,000
Storage Pond	1,175,000
Lift Station	77,000
Drainage Pump Station	158,000
Irrigation Pipelines	3,125,000
Irrigation Pump Station	469,000
Construction Total	$10,381,000
Technical Services (Design, Const. Eng'g, Support)	1,200,000
Legal, Fiscal & Administrative	15,000
Project Contingency	500,000
TOTAL PROJECT COST (1980)	$12,096,000

NOTES: Cost estimates assume construction in 1980 at an Engineering News Record (ENR) construction cost index of 288. The 1976 project report used an ENR index of 223, while the 1978 draft project report supplement used an ENR index of 255.

SOURCE: Jenks and Harrison, 1979.

The remainder of this chapter briefly summarizes the project alternatives considered by the City of Modesto, the current status of project planning, and major features of the project as currently proposed. Additional details are provided in subsequent chapters of this EIS whenever such data are necessary for analysis of project impacts. Irrigation reuse alternatives are discussed in greatest detail in Chapter 8, while effluent storage alternatives are presented in Chapter 11.

Facility Planning Considerations

Staging and Capacity Considerations

Clean Water Grant Program regulations require that project alternatives be evaluated in the context of a 20-year planning period. Actual grant awards for facility expansions, however, are often based on facility needs over a shorter period of time. Current regulations generally provide that pumping and interceptor systems will be funded on the basis of 20-year capacity needs while wastewater and sludge treatment facilities will be funded on the basis of 10-year capacity needs. These regulations also provide that funding for capacity increases will be based on 10- and 20-year projections of statewide and county growth developed by the California Department of Finance. Any capacity increases above these levels must be financed entirely by local funds. Capacity increases for industrial flows are also ineligible for Clean Water Grant funding. This approach is taken for several reasons: to allocate limited grant funds among numerous projects; to provide for possible changes in wastewater discharge requirements; and to recognize cost-effectiveness considerations in pipeline sizing. The current grant regulations result in some portions of the proposed project being designed to accommodate a 10-year growth increment while other portions are designed to accommodate a 20-year growth increment.

The 1976 project report assumed that construction of facility improvements would begin in 1977. Thus, that report estimated future sewage flows for 1987 and 1997. Peak month average daily flows were projected to increase from 36.7 MGD in 1975, to 40.1 MGD in 1977, 46.2 MGD in 1987, and to 52.3 MGD in 1997. These flow projections were based on the following population projections for the City of Modesto (excluding annexations of unsewered 1975 unincorporated area residents): 89,700 in 1977; 117,100 in 1987; and 144,200 in 1997. The project report flow projections also assumed that 4,000 unincorporated area residents are served by the Modesto system.

Actual 1977 peak month average daily flows were 40.2 MGD. Design of sludge handling facilities has been based on projected 1987 flows, recognizing that cannery flows contain about three times the solids loads of other components of the total flow. The 1976 project report estimates that 67.8 percent of the 1977-1987 increase in peak month suspended solids loading to the primary plant will be due to increased cannery flows, while these flows will account for only 41 percent of the increase in peak month sewage volumes.

Level of Treatment Considerations

The degree to which Modesto's wastewater must be treated depends on the means and location of effluent discharge or reuse (Table 3-3). In general, continued discharge to the San Joaquin River would require additional treatment processes to reduce current levels of biochemical oxygen demand (BOD) and suspended solids (primarily algae from the oxidation ponds). Improvements in effluent disinfection would also be necessary. If all improvements were made at the primary plant site and the city resumed discharging effluent to the Tuolumne River, the level of treatment would have to be improved beyond that required for San Joaquin River discharge. Use of treated effluent for agricultural irrigation would generally require less extensive treatment, but perhaps more effective disinfection, than is presently required for river discharge. Irrigation of food crops which can be eaten raw would require both additional treatment processes and more effective disinfection than would river discharge. Specific requirements will be established through reclamation permits issued by the Central Valley Regional Water Quality Control Board, in consultation with the California Department of Health Services and other concerned public agencies.

The Proposed Project and Alternatives Currently Under Consideration

Primary Treatment and Sludge Processing

The 1976 project report evaluated alternative facility improvements at the primary plant site. Planning for influent pumping and primary effluent pumping elements of the project anticipates installation of certain equipment elements about 10 years after initial facility construction. These deferred items would not be funded under the city's pending grant request. Table 3-4 summarizes the alternatives considered in that report. Modifications at the primary treatment facilities

Table 3-3

PROBABLE WASTE DISCHARGE REQUIREMENTS FOR MAJOR DISPOSAL OPTIONS

Effluent Disposal Option	BOD_5 (mg/l) 30-Day	BOD_5 (mg/l) 7-Day	BOD_5 (mg/l) Daily Max.	Suspended Solids (mg/l) 30-Day	Suspended Solids (mg/l) 7-Day	Suspended Solids (mg/l) Daily Max.	Settleable Matter (mg/l) 30-Day	Settleable Matter (mg/l) Daily Max.	Total Coliform MPN/100 ml 30-Day	Total Coliform MPN/100 ml Daily Max.
Tuolumne River	15			15					23	
San Joaquin River	30	45	90	30	45	90	0.1	0.2	23	500
Agricultural Irrigation*	30-50		90	75				0.2	2.2-1,000	

*Precise requirements will depend on specific reuse areas and crops being irrigated.

SOURCE: Jenks and Harrison, 1976; 1978a.

Table 3-4

PRIMARY TREATMENT FACILITY ALTERNATIVES

Process	Problem	Alternative Solution	Cost or Other Considerations
A. Influent Pumping	Lower level capacity will be insufficient	1. Enlarge existing station	1. Piping and space limitations make this infeasible
		*2. New pumping plant for excess lower level flows	2. $1,000,000 (capital cost only) inincluding shop facilities
B. Primary Effluent Pumping	Insufficient capacity - 40 ft. pumping head limit on existing outfall	1. Booster pumping at Carpenter Road, parallel outfall in 1989	1. $1,097,000 - present worth cost
		2. Booster pump at Whitmore Road, parallel outfall in 1989	2. $1,557,000 - present worth cost
		*3. Booster pumping at Carpenter Road, Booster pumping at Jennings Road in 1989	3. $975,000 - present worth cost
		4. New effluent pumping plant and new parallel outfall	4. $2,733,000 - present worth cost
		5. New effluent pumping plant, partial parallel outfall and booster pumping	5. $1,292,000 - present worth cost
		6. Enlarge existing pumping plant and new parallel outfall	6. $2,585,000 - present worth cost
		7. Enlarge existing pumping plant and add booster pumping	7. $1,091,000 - present worth cost
C. Sludge Thickening	Insufficient capacity for vacuator underflow and primary sludge	1. New gravity thickeners	1. $1,420,000 - present worth cost
		*2. New air flotation thickeners	2. $1,150,000 - present worth cost
D. Sludge Digestion	Insufficient capacity	*1. Additional anaerobic digester	1. $700,000 - capital cost
		2. Aerobic digestion for all sludge	2. Power requirements high
		3. Incineration	3. $2,000,000 capital cost
E. Control Building	Insufficient size, 1,300 ft^2 more needed	*1. Expand existing building	1. $75,000
		2. Construct new building	2. $90,000
F. Power Generator	Digester gas is wasted	*1. Construct generation facilities	1. Net gain of $3,500/year

*Alternative recommended in the 1976 project report.

SOURCE: Jenks and Harrison, 1976.

would be required regardless of the effluent disposal means selected. Project elements recommended by the 1976 project report (as modified by the 1979 project report supplement) are discussed briefly below. Figure 3-1 shows the proposed site layout for these facilities.

Influent Pumping. Increased influent pumping and headworks facilities would be constructed to accept flows from the proposed West Trunk interceptor recently approved by the city. The new pump station would be designed to house four pumps, although only three (one rated at 0.13 MG/HR and two rated at 0.38 MG/HR) would be installed initially. The initial installation of three pumps is intended to meet projected 10-year capacity needs using any two of the three pumps. Future installation of a fourth pump would provide capacity for an additional 10 years while keeping one pump on standby. A cross-connection to the existing lower level pump station would also be provided. The new headworks would provide two bar screens (0.5 MG/HR each) with space for a third one in the future.

Primary Effluent Pumping. The 100 hp pump at the existing effluent pump station would be replaced with a 200 hp unit. A booster pump station with space for four pumps would be constructed near the location where the outfall to the oxidation ponds crosses Carpenter Road. Three pumps (1.33 MG/HR capacity each) would be installed initially, with one pump for standby. A similar second booster pump station would be constructed in the future near the location where the outfall to the oxidation ponds crosses Jennings Road. These booster pumps will allow the existing outfall to carry projected future sewage flows without the need for a parallel outfall.

Sludge Thickeners. Two 70-foot diameter, covered air flotation thickeners would be constructed to replace the existing thickener and provide added thickener capacity. The ventilation system would be equipped with scrubbers for odor control. The air flotation equipment would be utilized only during the canning season, with the thickeners operating on a gravity basis during the remainder of the year. Design criteria for the sludge thickeners are based on projected 10-year capacity needs.

Sludge Digesters. One new anaerobic digester is proposed. This unit will serve as a primary digester, and will be equal in size to the largest existing digester. In addition to being the lowest cost alternative, anaerobic digestion produces methane gas which will be used to heat the digesters and to provide fuel for part of the city's vehicle fleet. Sludge digester sizing is based on projected 10-year capacity needs.

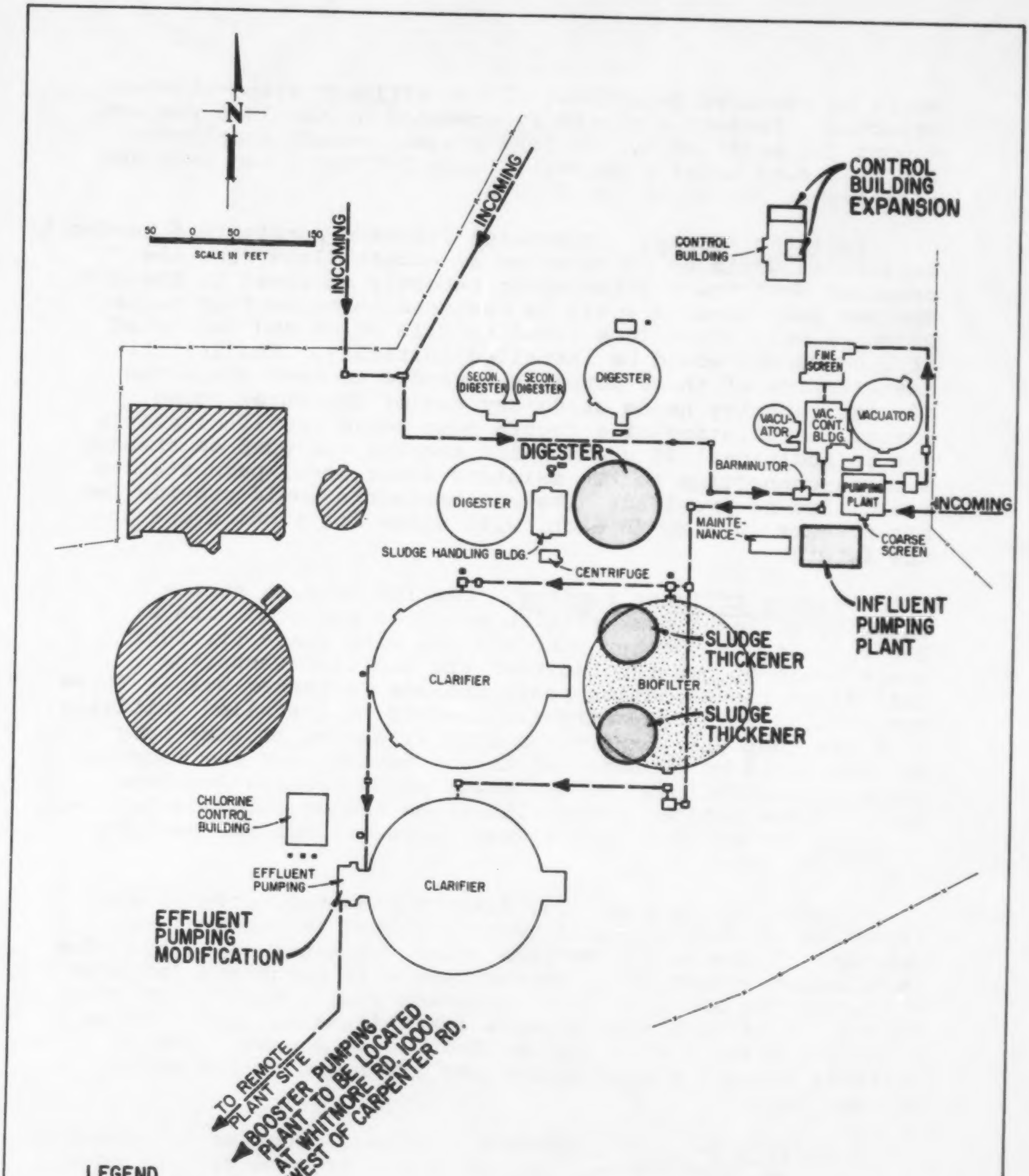

N
50 0 50 150
SCALE IN FEET
INCOMING
INCOMING
CONTROL BUILDING EXPANSION
CONTROL BUILDING
SECON. DIGESTER
SECON. DIGESTER
DIGESTER
FINE SCREEN
VACU-ATOR
VAC. CONT. BLDG.
VACUATOR
DIGESTER
BARMINUTOR
PUMPING PLANT
INCOMING
DIGESTER
MAINTE-NANCE
COARSE SCREEN
SLUDGE HANDLING BLDG.
CENTRIFUGE
INFLUENT PUMPING PLANT
SLUDGE THICKENER
CLARIFIER
BIOFILTER
SLUDGE THICKENER
CHLORINE CONTROL BUILDING
EFFLUENT PUMPING
CLARIFIER
EFFLUENT PUMPING MODIFICATION
TO REMOTE PLANT SITE
BOOSTER PUMPING PLANT TO BE LOCATED AT WHITMORE RD. 1000' WEST OF CARPENTER RD.
LEGEND
☐ EXISTING STRUCTURES
▩ NEW STRUCTURES
░ EXIST. STR. TO BE REMOVED
▨ ABANDONED STRUCTURES

FIGURE 3-1
CITY OF MODESTO
PRIMARY TREATMENT PLANT IMPROVEMENTS

SOURCE: JENKS & HARRISON, 1976

Other Site Modifications. Additional sludge drying beds will be constructed to meet future requirements. The existing control building will be enlarged to provide additional laboratory space, a new employee lunch room, and employee locker space. The existing biofilter tank will be removed to make room for the new sludge thickeners. Other minor site improvements will also be made.

Secondary Treatment and Effluent Disposal Alternatives

Since preparation of the 1976 project report, 60 new floating aerators have been added at the city's oxidation ponds, thus implementing a major improvement evaluated during initial project planning. The 1979 project report supplement recommends that about 36 additional 40 hp aerators be installed. The 1976 project report also recommends construction of new chlorine mixing facilities at the oxidation pond site. Separate dechlorination facilities (using sulfur dioxide) are also proposed, so that the current 0.1 mg/l residual chlorine limit for effluent discharge can be met. The necessity for additional secondary treatment improvements will depend on the method of effluent disposal.

River Discharge Alternatives. The 1976 project report evaluated eight alternatives utilizing river discharge for effluent disposal. Two alternatives were considered for secondary treatment at the primary plant site, with discharge to the Tuolumne River. Tuolumne River discharge was only considered feasible when secondary treatment was at this site. Both activated sludge treatment and activated biofilter concepts were evaluated, with the latter having the lowest cost.

Six alternatives were considered for San Joaquin River discharge. All included continued use of the existing primary plant and remote ponds. Modifications for more efficient removal of organics at the remote ponds consisted of either additional ponds, biological filters ahead of the existing ponds, or additional floating aerators in the existing ponds. For algal removal, the addition of dissolved air flotation or intermittent sand filtration were considered. Combinations of the three concepts for organic removal with the two alternatives for algal removal gave the six alternatives evaluated. The alternative with the lowest present worth cost is the use of additional floating aerators in the existing ponds, followed by intermittent sand filtration for algal removal. This alternative also had a much lower cost than the lowest cost Tuolumne River discharge alternative.

Irrigation Reuse Alternatives. Alternative land application concepts considered feasible by the project report included use of additional ponds for evaporation and percolation, irrigation on city-owned agricultural land, irrigation on privately-owned agricultural land, and combinations of irrigation on agricultural land during the summer months and San Joaquin River discharge during the winter months. In the initial evaluation, use of treated wastewater by Pacific Gas and Electric for their proposed nuclear plant was also considered, but deleted from additional consideration due to both timing and the availability of more attractive water supplies for the proposed nuclear plant. A preliminary cost evaluation indicated that the least costly land application alternative would be to upgrade the existing ponds by the addition of floating aerators to the existing ponds, and to use the pond effluent for irrigation on privately-owned pasture land. This approach was also judged to be less costly than any of the river discharge alternatives. This irrigation alternative was developed and evaluated in greater detail in the 1979 project report supplement prepared by Jenks and Harrison, and the 1978 EIR supplement by J. B. Gilbert and Associates.

The irrigation alternative currently being pursued would involve construction of an additional storage pond adjacent to the existing oxidation ponds; intermittent winter discharge of effluent to the San Joaquin River to reduce storage requirements; and distribution of effluent to various agricultural properties during the March-October period. The project report supplement also recommends a 2 MGD algal filtration system at the oxidation ponds to permit year-round discharge of some effluent to the San Joaquin River.

While the basic framework of a proposed project has been established, several details are not yet resolved. The 1979 project report supplement identified and evaluated four alternatives for providing increased effluent storage capacity at the oxidation pond site. Eight different combinations of potential irrigation areas have also been evaluated. The city must eventually sign long-term agreements with a sufficient number of the interested land owners so that timely reuse of future effluent volumes is assured.

In order to implement the proposed project, two aspects of the city's current discharge permit must be revised. The existing discharge requirements are based on a 45 MGD design flow. The project report anticipates that intermittent winter discharges will be made at flow rates of 50 or 70 MGD. The existing waste discharge requirements also contain a condition that effluent used for irrigation must meet a 30-day average

BOD level of 40 mg/l. The city has requested that this condition be changed to 50 mg/l BOD. The staff of the Central Valley Regional Water Quality Control Board has responded favorably to this request, although no formal action has been taken to modify the existing discharge requirements. A legal opinion from the chief counsel of the State Water Resources Control Board appears to require more stringent BOD limitations on any effluent delivered directly to the irrigation canal systems of local irrigation districts. That legal opinion indicates that any effluent discharge to an irrigation canal which drains into a natural waterway will require treatment levels similar to those required for river discharge (BOD levels of 30 mg/l).

Any irrigation reuse of treated effluent will also require a reclamation permit from the Regional Water Quality Control Board. The California Department of Health Services has expressed reservations about the ability of the proposed project to consistently meet the disinfection requirements (established by state law) which would apply to reuse in the West Stanislaus Irrigation District. Five of the eight reuse alternatives evaluated by the 1979 project report involve reuse in the West Stanislaus Irrigation District. More detailed project design work will be required to clarify the ability of the proposed facilities to meet the required disinfection standards.

Project Postponement

Project postponement is a viable option if the engineering or environmental analysis of project alternatives identify major issues requiring detailed study before a specific project can be recommended. No such issues bearing on choice of project alternatives have yet been raised.

No Project

Any evaluation of project alternatives must consider the option of making no significant changes in the present situation -- the no-project alternative. The no-project alternative for the Modesto wastewater system would perhaps include minor changes in operating procedures to minimize existing problems. Effluent would continue to be discharged to the San Joaquin River. While the recent addition of 60 aerators at the oxidation ponds will improve the quality of effluent from the ponds, existing discharge requirements for BOD, suspended solids, residual chlorine levels, and coliform levels would continue to be violated during the summer and fall. The West Trunk interceptor project would have to be cancelled, since there would not be any facilities at the primary plant site to receive the sewage carried by this trunk line.

System Capacity Following Completion of the Proposed Project

Several aspects of the proposed project will determine the effective capacity of the city's wastewater collection and treatment system. It should be recognized at the outset that the City of Modesto is undertaking two trunk sewer construction projects which are related to the proposed treatment plant improvements. The Dryden Interceptor project will install a 2.63 MG/HR trunk sewer parallel to the existing Industrial Trunk. The Dryden Trunk will carry sewage flows from the East and Tenaya sewer services areas, while the Industrial Trunk will continue to serve the Downtown, Santa Rosa, and South service areas (see Figure 2-1). The Dryden Trunk will thus eliminate the peak flow overloads currently experienced by the Industrial Trunk. The West Trunk project will provide a 1.25 MG/HR trunk sewer to serve the West and North sewer service areas, eliminating the current force main connection of these areas to the Emerald Trunk.

It should also be recognized that the city is deferring the construction or installation of some facilities (the second primary effluent booster pumping plant, one pump at the first primary effluent booster pumping plant, and a bar screen and one pump at the new lower level influent pumping plant). These items will not be funded under the city's current grant request, although some of the facilities funded by the grant would be designed to accommodate future equipment installation. The deferred items identified above have an estimated capital cost of $471,400 (1980 dollars). Capacity increases provided by these facilities are dependent on completion of initial project construction. While future capacity increases may also require additional sludge processing facilities, it is clear that these planned future construction items will cost substantially less than the $12.1 million estimated for the proposed initial construction. Thus, this EIS has evaluated capacity aspects of both initial and planned future construction projects.

Influent Pump Stations

The new influent pump station represents a major element of the facility improvements proposed for the primary treatment plant site. This new pump station would receive the sewage flows carried by the West Trunk interceptor. Initial construction would provide two large and one small pump; a third large pump would be added in the future. Recognizing the peaking factors currently exhibited by sewage flows from different areas of the city (Table 3-5), the new pump station will provide an initial 8.6 MGD (peak month average daily flow basis) influent pumping capacity increase (assuming one of the large pumps is kept as standby). With future installation of the fourth pump, the new influent pump station will provide a total of 15 MGD in new pumping capacity (with one of the 6.4 MGD pumps on standby).

It should be noted that while the existing influent pump stations have a nominal peak month average daily flow capacity of 43.9 MGD, current peak month flows of 40.2 MGD are producing overload conditions. This occurs because flows in the Emerald and Sutter Trunks peak during the winter, while flows in the Industrial Trunk peak during the late summer (producing peak flow conditions for the overall system). Because there is no interconnection between the two existing pump stations, their combined capacity is not available for summer peak flows.

The design for the new lower level pump station includes a cross-connection with the existing lower level pump station. Thus, whenever flows in the Industrial and Dryden Trunks exceed the capacity of the existing lower level pump station, the excess flows can be diverted to the new pump station. The above data implies that the proposed project will increase influent pumping capacity from 43.9 MGD to 52.5 MGD, while planned future construction would increase pumping capacity to 58.9 MGD. These pumping capacities will be physically present at the treatment plant, but a change in the city's sewer trunk system will prevent full utilization of this capacity.

As noted above, the West Trunk project will eliminate the existing force main connection which allows sewage flows from the North and West service areas to be received at the existing upper level pump station. With completion of the proposed new lower level pump station and the West Trunk, this force main will be converted to a gravity sewer serving development of adjacent lands. The Emerald and Sutter service areas will then be the only areas contributing sewage flows to the existing upper level pump station. There are presently about 550 acres of undeveloped residentially zoned land in these two sewer service areas (based on analysis of data in City of Modesto, 1978d). Even with full development of this vacant land, sewage flows from the Emerald and Sutter service areas will be substantially less than the 14 MGD pumping capacity of the existing upper level pump station.

Table 3-5

1975 SEWAGE FLOWS AND PEAKING FACTORS FOR AREAS SERVED BY DIFFERENT INFLUENT PUMP STATIONS

	Component of Flow			
Pump Station For:	Domestic	Nonseasonal Industry	Seasonal Industry	Total
Industrial Trunk				
Peak Hour Rate	6.30 MGD	3.20 MGD	27.46 MGD	36.96 MGD
Peak Month ADF	4.50 MGD	2.00 MGD	21.09 MGD	27.59 MGD
Peaking Factor				1.34
Emerald/Sutter/West Trunks				
Peak Hour Rate	8.40 MGD	3.20 MGD	1.45 MGD	13.05 MGD
Peak Month ADF	6.00 MGD	2.00 MGD	1.11 MGD	9.11 MGD
Peaking Factor				1.43
West Trunk Only				
Peak Hour Rate	3.00 MGD	-	-	3.00 MGD
Peak Month ADF	2.14 MGD	-	-	2.14 MGD
Peaking Factor				1.40
Emerald/Sutter Trunks				
Peak Hour Rate	5.40 MGD	3.20 MGD	1.45 MGD	10.05 MGD
Peak Month ADF	3.86 MGD	2.00 MGD	1.11 MGD	6.97 MGD
Peaking Factor				1.44
TOTAL FLOW				
Peak Hour Rate	14.7 MGD	6.4 MGD	28.9 MGD	50.0 MGD
Peak Month ADF	10.5 MGD	4.0 MGD	22.2 MGD	36.7 MGD
Peaking Factor	1.40	1.60	1.30	1.36

NOTES: MGD - million gallons per day
ADF - average daily flow
Peak Hour Rate - 24 x peak one hour flow volume
Peaking Factor - peak hour rate ÷ peak month ADF

DATA SOURCES: Table IV-5 and V-2 in Jenks and Harrison, 1976; nonseasonal industry and seasonal industry flows allocated by Jones & Stokes Associates based on list of industrial dischargers, land use maps, and Figure 2-1.

Without a cross-connection to the existing lower level pump station or the proposed new lower level pump station, about 6 MGD in pumping capacity (average daily flow basis) will remain unused. No such cross-connection has been proposed by the city or the project engineers. It should also be noted that once the existing force main connection of the West and Emerald Trunks is converted to a gravity sewer with direct connections of residential areas, it will not be possible to convert it back to a force main. Because the West Trunk will be significantly deeper than the Emerald Trunk, it would be expensive to establish a future connection between the West and Emerald Trunks.

Thus, the 8.6 MGD pumping capacity increase at the new lower level pump station will be off-set to a large degree by the fact that the existing upper level pump station will no longer be used to capacity. Current sewage flows from the Emerald and Sutter service areas are about 7.2 MGD on an average daily flow basis (10.3 MGD peak hour rate estimate from Jenks and Harrison, 1976 adjusted by peaking factor from Table 3-5). If development were to occur on all vacant residentially zoned land in the Emerald and Sutter sewer service areas, an additional 1.25 MGD in sewage (average daily flow basis) could be expected at the existing upper level pump station. This estimate is based on a gross residential density of 6 units per acre, 2.65 persons per dwelling unit, and a sewage generation rate of 142.9 gpcd (gallons per capita per day). However, a significant portion of the available 550 acres will probably remain undeveloped for some time due to such factors as parcel ownership, parcel size, and parcel location (Osner, pers. comm.).

For purposes of this EIS, projected flows from the Emerald and Sutter service areas have assumed development of 25 percent of available vacant land during the period served by initial project construction. Thus, flows from the Emerald and Sutter service areas would be expected to reach 7.5 MGD on an average daily flow basis. Assuming 70 percent development of currently available vacant land through the period served by planned future construction, flows to the upper level pump station would reach 8.1 MGD. Thus, unutilized upper level pump station capacity would be about 6.5 MGD for the period served by initial project construction, and 5.9 MGD for the period served by planned future construction.

Correcting for unutilized upper level pump station capacity, initial construction of the proposed project provides a net increase of influent pumping capacity of 2.1 MGD (average daily flow basis); planned future construction would provide an additional 7.0 MGD capacity increase. The combined influent pumping capacity of the treatment plant would be increased from the current 43.9 MGD to 46.0 MGD by initial project construction, and to 53.0 MGD by planned future construction.

Primary Effluent Pumping

As noted in Table 2-1, the existing effluent pumps can deliver 44.1 MGD to the remote oxidation pond (assuming all three large pumps are operating). Replacement of the small standby pump and installation of the proposed booster pump station will increase this capacity to about 47.1 MGD initially. The proposed second booster pump station will further increase capacity to about 52.8 MGD (Campbell, pers. comm.).

Vacuators and Clarifiers

Table 2-1 indicates that the vacuators and clarifiers at the primary plant site should serve as capacity constraints after improvements to the influent and effluent pumping facilities. A more detailed analysis, however, reveals that this will not be the case. The city plans to operate the treatment facilities during the canning season so that only the flows from the existing lower level pump station are sent to the fine screens and the vacuators. Flows from the existing upper level pump station and the new pump station would be bypassed directly to the clarifiers.

The clarifiers do not pose the capacity constraint that their nominal capacity rating appears to indicate. Key design factors for clarifiers involve detention time at peak flow conditions and resultant wastewater overflow rates. Peak month average daily flows of 60 MGD would reduce detention time from the 2.5-hour design basis to 1.86 hours. Overflow rates would be increased from the design basis of 710 gpd/sq. ft. (gallons per day per square foot) to 955 gpd/sq. ft. These factors would still be within the normal range of clarifier design parameters. The change from river discharge to agricultural irrigation (with the proposed change in BOD limitations), and the proposed addition of about 36 additional aerators at the oxidation ponds both serve to relax performance requirements for the primary clarifiers.

Sludge Processing Elements

The proposed project includes new sludge thickeners and a 59 percent increase in primary digester capacity. The added sludge digester will remedy an existing deficiency in digester capacity as well as providing capacity for projected increases in solids loading to the primary treatment plant. Clean Water Grant Program regulations limit design of sludge handling facilities to a 10-year design period as opposed to the 20-year design basis for wastewater pumping facilities.

Thus, design criteria for sludge handling facilities, as presented in the 1976 project report, are based on a projected 1987 wastewater flow of 46.2 MGD (peak month average daily flow).

Sludge digester capacity for the Modesto treatment plant is not easily evaluated in terms of wastewater flow volumes. Cannery flows contain about 3 times the suspended solids concentration of the remaining flow components in the Modesto system. Thus, the project report indicates that while cannery flows will account for 41 percent of the projected 1977-1987 increase in peak month sewage flow, they will also account for 67.8 percent of the corresponding increase in suspended solids loads. The 1976 project report forecasts a 2.5 MGD increase in peak month cannery flows between 1975 and 1977, with additional 2.5 MGD increases during the 1977-1987 and 1987-1997 time periods. If increases in peak month cannery flows exceed the projections in the project report, the proposed sludge handling facilities will reach capacity at peak month sewage flows of less than 46 MGD. If, on the other hand, cannery flow increases are less than those projected by the project report, the proposed sludge handling facilities will be able to process sludge loads from peak month flows exceeding 46 MGD.

Effluent Disposal Aspects

Since completion of the 1976 project report, continuing project planning and design has focused on irrigation reuse of treated effluent. A viable irrigation reuse project requires long-term (20-year) contracts with individual landowners and perhaps with the West Stanislaus Irrigation District. While the required effluent distribution pipelines and pumps are eligible for Clean Water Grant Program funding on the basis of 20-year flow projections, the City of Modesto has decided to design these elements on the basis of 10-year flow projections. The 1979 project report supplement cites three reasons for this decision:

- "The ability to increase pipeline capacity by increasing the number of hours of pumping or by increasing the operating pressure, provided the pipe is designed with this in mind.
- "The desirability of maintaining a nearly uniform commitment of effluent water to land users during the 20-year agreement period.
- "The possibility of discovering low cost treatment alternatives which would be more effective than additional increases in discharge of effluent to crop lands." (Jenks and Harrison, 1979).

In addition to annual deliveries of 6,082 MG (18,662 acre-feet) of treated effluent for irrigation use, the project report anticipates a program of intermittent winter discharges to the San Joaquin River. The 1979 project report supplement also recommends construction of a 2 MGD sand filter system to allow additional continuous discharge to the river. Based on analyses of historical effluent quality, the project report estimated that winter effluent quality would allow intermittent discharges on at least 21 days during the months of December through February. The city's EIR on the irrigation aspects of the project (J. B. Gilbert and Associates, 1978) contains an additional analysis of winter discharge possibilities. That document indicates that by beginning the winter discharge period in November, it might be possible to discharge effluent to the river on an average of 37 days per year, although this frequency would vary significantly between individual years. Neither of these analyses attempted to account for effluent quality improvements due to the recent addition of 60 aerators at the ponds, the proposed installation of 36 additional 40 hp aerators, possible changes in oxidation pond operating procedures, or improved primary effluent quality due to proposed sludge processing improvements.

Table 3-6 indicates that potentially feasible increases in the frequency of intermittent winter discharges would allow disposal of projected 1997 effluent volumes without requiring increased effluent storage facilities or alteration of contracts with irrigators receiving treated effluent. Thus, while irrigation contracts are being negotiated on the basis of projected 1989 effluent flows, the proposed project appears sufficiently flexible to allow disposal of increased effluent volumes well beyond that date.

Summary

The project as currently proposed represents an inherently flexible method of meeting the city's wastewater treatment needs. This flexibility, however, makes it very difficult to identify a precise capacity limit in terms of sewage flows. Both the influent pumping and primary effluent pumping facilities serve as significant capacity constraints. Due to sewer trunk system changes which will be made concurrently with initial project construction, about 6 MGD of existing influent pumping capacity will be effectively taken out of service, even though the pumps will physically remain in the upper level pump station. Thus, the initial construction of a

Table 3-6

CONDITIONS UNDER WHICH THE PROPOSED PROJECT COULD DISPOSE OF PROJECTED 1997 EFFLUENT FLOWS

				40.5" Irrigation Rate & 70 MGD Winter Discharge					43" Irrigation Rate & 50 MGD Winter Discharge				
Month	1997 Pond Inflow[1]	Net Percolation & Evaporation Loss[2]	Available Effluent	Irrigation Applications[3]	Filtered Discharge[4]	Winter Discharge[5]	Change in Storage	Storage Requirement	Irrigation Applications[6]	Filtered Discharge[4]	Winter Discharge[7]	Change in Storage	Storage Requirement
J	668	8	660		62	420	178	525		62	350	248	760
F	607	20	587		56	359	172	697		56	321	210	970
M	720	123	597	450	62		85	782	450	62		85	1,055**
A	739	207	532	450	60		22	804*	450	60		22	1,077**
M	759	275	484	600	62		-178	626	600	62		-178	899
J	685	330	355	750	60		-455	171	900	60		-605	294
J	1,019	296	723	832	62		-171	0	900	62		-239	55
A	1,604	247	1,357	1,200	62		95	95	1,350	62		-55	0
S	1,617	203	1,414	1,200	60		154	249	1,200	60		154	154
O	1,157	161	996	600	62		334	583	600	62		334	488
N	589	40	549		60	630	-141	442		60	500	-11	477
D	605	8	597		62	630	-95	347		62	500	35	512
Total	10,769	1,918	8,851	6,082	730	2,039	0	NA	6,450	730	1,671	0	NA

NOTES AND SOURCES:

All values in millions of gallons.
* Storage requirement can be met using any of the four storage pond alternatives.
**Storage requirements can be met by storage pond alternatives A, B, or C.

[1] Calculated by Jones & Stokes Associates using 1997 flow projections from Table IV-5 of the 1976 project report (Jenks & Harrison, 1976) and monthly inflow pattern for 1989 presented in Table V-1 of the 1978 project report supplement (Jenks & Harrison, 1978a).

[2] From data in Table V-1 of the 1978 project report supplement.

[3] From Table V-9 of the 1978 project report supplement.

[4] Based on 2 MGD effluent filtration facility recommended in the 1978 project report supplement.

[5] Assuming 30 days of discharge at about 70 MGD; monthly discharge frequency based on data in Appendix E of the 1978 supplemental EIR (J. B. Gilbert & Associates, 1978).

[6] From Table V-2 of the 1978 project report supplement.

[7] Assuming 34 days of discharge at about 50 MGD; monthly discharge frequency based on data in Appendix E of the 1978 supplemental EIR J. B. Gilbert & Associates, 1978).

new pump station will produce only a small (4.8 percent) increase in overall system capacity (an increase from 43.9 MGD to 46.0 MGD). A more significant capacity increase (a cumulative increase of 20.7 percent, to about 53 MGD) will be possible at relatively modest cost. Basic elements of this planned future construction have been outlined in the 1976 project report. Table 3-7 summarizes the wastewater treatment unit capacity changes planned for the primary plant site.

The sludge handling facilities at the primary plant site will, after project construction, have essentially the same capacity as the wastewater processing and disposal facilities. The 1976 project report does not indicate any planned future expansion of sludge processing facilities. But inadequacies in the sludge handling facilities do not provide the type of capacity constraint inherent in the wastewater handling components of the system. Overloading of sludge processing facilities will produce operating problems and some deterioration in effluent quality (due to digester and thickener supernatant flows). But these factors are not the immediate capacity constraint that is posed by inadequate pipeline or pump capacity. Data in the 1976 project report indicate that about 55 percent of the new sludge digester capacity will be used to meet the overload conditions produced by existing (1977) sludge volumes, which exceed existing primary digester capacity by about 32 percent. The 1976 project report indicates that 1997 peak month solids loads will be 11 percent greater than the design basis for initial project construction.

Projected Sewage Flows

The proposed project has been planned on the basis of population and sewage flow projections summarized at the beginning of this chapter. Recent increases in sewage flows, however, have prompted a review of the sewage generation rates used by the 1976 project report. Historical sewage flow data (Table 3-8) illustrate that noncannery flows have not always paralleled city growth. Particularly striking is the 4-year period of 1974 through 1977. While the city increased in population by about 25 percent during this time, sewage flows remained nearly constant. This may be largely a result of water conservation measures resulting from recent drought conditions.

At first glance, it appears that stormwater inflow may be a significant factor affecting noncanning season sewage flows, since 1973 and 1978 had rainfall levels significantly above normal (by 53 and 70 percent, respectively). Only

Table 3-7

UNIT CAPACITIES FOR PRIMARY PLANT FACILITIES

Facility Unit	Existing Conditions	After Initial Construction	With Planned Future Construction
Pumping plant for Emerald and Sutter Trunks:			
Design Capacity[1]	0.83 MG/Hr. (20 MGD rate)	0.45 MG/Hr. (10.8 MGD rate)	0.49 MG/Hr. (11.7 MGD rate)
Peaking Factor[2]	1.43	1.44	1.44
Peak Month ADF Basis[3]	14.0 MGD	7.5 MGD	8.1 MGD
Pumping Plant for Industrial Trunk:			
Design Capacity[4]	1.67 MG/Hr. (40 MGD rate)	1.67 MG/Hr. (40 MGD rate)	1.67 MG/Hr. (40 MGD rate)
Peaking Factor[2]	1.34	1.34	1.34
Peak Month ADF Basis[3]	29.9 MGD	29.9 MGD	29.9 MGD
Pumping Plant for West Trunk:			
Design Capacity[5]	-	0.5 MG/Hr. (12 MGD rate)	0.88 MG/Hr. (21 MGD rate)
Peaking Factor[2]	-	1.40	1.40
Peak Month ADF Basis[3]	-	8.6 MGD	15.0 MGD
Combined Influent Pumping Units			
Design Capacity	2.5 MG/Hr. (60 MGD rate)	2.62 MG/Hr. (62.8 MGD rate)	3.03 MG/Hr. (72.7 MGD rate)
Peak Month ADF Basis	43.9 MGD	46.0 MGD	53.0 MGD
Rotary Fine Screens[6]			
Design Capacity[7]	2.92 MG/Hr. (70 MGD rate)	2.92 MG/Hr.	2.92 MG/Hr.
Peaking Factor[8]	1.36	1.36	1.36
Peak Month ADF Basis[3]	51.5 MGD	51.5 MGD	51.5 MGD
Vacuators:[6]			
Design Capacity[9]	45 MGD	32.4 MGD	32.4 MGD
Primary Clarifiers			
Design Capacity[10]	44.6 MGD	Probably close to 60 MGD	Probably close to 60 MGD
Primary Effluent Pumping:			
Design Capacity[11]	1.92 MG/Hr. (46 MGD rate)	2.67 MG/Hr. (64 MGD rate)	About 2.99 MGD/Hr. (71.8 MGD rate)
Peaking Factor[8]	1.36	1.36	1.36
Peak Month ADF Basis[3]	33.8 MGD	47.1 MGD	About 52.8 MGD

NOTES AND SOURCES:

MGD - million gallons per day
MG/Hr. - million gallons per hour
ADF - average daily flow

[1] Data for existing conditions from 1976 Project Report, Figure V-12. One pump (0.21 MG/Hr. = 5 MGD rate) on standby. Values listed for initial construction and planned future construction conditions reflect projected flow rather than physical pumping capacity. See text for clarification.

[2] See Table 3-5.

[3] Design capacity MGD rate divided by peaking factor.

[4] Data from 1976 Project Report, Figure V-12, page V-16, page IX-2, and Table IX-1. One pump (0.47 MG/Hr. = 11.2 MGD rate) held on standby.

[5] Data from 1976 Project Report, page IX-4 and Table IX-1. One pump (0.38 MG/Hr. - 9 MGD rate) held on standby.

[6] After initial project construction, this unit will be operated so as to receive flows only from the pump station for the Industrial and Dryden Trunks (page IX-15 of the 1976 Project Report).

[7] Data from 1976 Project Report, Table V-1; assume value in Table IX-1 is in error.

[8] Based on 1975 flow data as reported in Table IV-5 of the 1976 Project Report.

[9] Existing capacity (peak month ADF basis) calculated from data in Table V-1 of the 1976 Project Report. After initial project construction, the change in facility operating procedures (see note [6]) will require increased detention time for flows treated by this unit. The resultant change in capacity (peak month ADF basis) was calculated from data in Table IX-1 of the 1976 Project Report.

[10] Existing capacity (peak month ADF basis) calculated from data in Table V-1 and Table IX-1 of the 1976 Project Report. As discussed in the text, altered BOD requirements for irrigation reuse of effluent plus the addition of more aerators in the oxidation ponds will allow reduced detention time in the clarifiers. This will significantly increase clarifier capacity. While the precise post-project capacity is uncertain, the detention time and overflow rate at 60 MGD do not appear to be a problem.

[11] Existing capacity from 1976 Project Report (page V-16 and page VII-9). One 200-hp pump (0.83 MG/Hr. = 20 MGD rate) on standby. With all 200-hp pumps operating, the existing pumping plant has a design capacity of 2.5 MG/Hr. (60 MGD rate), or 44.1 MGD on a peak month ADF basis. Capacity values for initial construction based on page IX-4 of the 1976 Project Report. One pump at the existing pump station (0.83 MG/Hr. = 20 MGD rate) and one pump at the booster pump station (1.33 MG/Hr. = 32 MGD rate) on standby. Planned future construction would add a fourth pump (1.33 MG/Hr. = 32 MGD rate) at first booster pump station; sizing of pumps for second booster pump station not specified in 1976 Project Report. Overall primary effluent pumping capacity with planned future construction from Campbell (pers. comm.); one pump on standby at each pumping facility.

Table 3-8

HISTORICAL SEWAGE FLOWS AND CITY POPULATIONS

	Average Daily Flow Volume, MGD								
Time Period	1970	1971	1972	1973	1974	1975	1976	1977	1978
8-month noncanning season[1]	11.9	13.0	14.5	17.2	14.6	14.5	14.6	14.4	16.0
Annual average	16.2	17.6	19.9	21.4	19.7	19.7	18.7	19.7	21.3
4-month canning season[2]	19.7	26.7	30.6	29.6	29.7	30.0	27.0	30.2	31.6
Peak month	30.9	34.6	38.3	37.3	38.3	36.7	35.2	40.1	39.6
City populations[3]	61,700	66,900	69,900	73,900	75,500	81,900	85,200	89,900	94,500

Notes and Sources:

All sewage flow values from Campbell, 1979.

[1] January-June plus November-December.

[2] July-October.

[3] 1970 value (April 1) from City of Modesto, 1977d.
1971 value (July 1) from City of Modesto, 1977d.
1972 value (April 1) from City of Modesto, 1977d.
1973-1978 values (January 1) from California Department of Finance, 1974; 1975; 1976; 1977b; and 1979.

1974 had "normal" rainfall, while the remaining years in the 1971-1978 period had 23 to 49 percent below normal rainfall. This correlation of wet years with high sewage flows appears, however, to be coincidental. The infiltration/inflow analysis in the 1976 project report indicates an inflow rate of 9.1 million gallons per inch of rainfall. When sewage flow data are adjusted to a normal rainfall amount, 1973 and 1978 noncanning season flows are still significantly above 1974-1977 values. Adjusted values are 17.0 MGD for 1973; 14.6 MGD for 1974, 1975, and 1977; 14.8 MGD for 1976; and 15.7 MGD for 1978. Thus, recent flows appear to reflect a true change in sewage generation, rather than an artifact of recent drought conditions.

Available data for 1979 indicate that noncanning season flows will average about 17.7 MGD, compared to the 1978 average of 16.0 MGD. Current nonseasonal industry flows average 5 MGD (Campbell, pers. comm.). Assuming that commercial land uses generate sewage flows equal to the nonseasonal industry volume, residential areas are estimated to generate 7.7 MGD. Since Modesto is an employment and shopping center for much of Stanislaus County, it is reasonable to project future commercial and nonseasonal industry flows on the basis of USSA (ultimate sewer service area) population forecasts. Residential sewage flows are clearly related more closely to city than to USSA population levels. There are also about 4,000 residents in unincorporated areas (primarily the Empire Sanitary District) connected to the Modesto sewer system (Jenks and Harrison, 1976).

The sewage flow projections in the 1976 project report were based only on projected sewered population (city plus currently connected unincorporated areas) using 1975 flow data. The 1976 project report did not estimate flows from annexations of currently unsewered urban area residents. The sewage flow projections prepared for this EIS have used 1979 sewage flow data, and have used both city and USSA population forecasts for different components of the total sewage flow. (These procedures were suggested by the City of Modesto Director of Public Works). Projected annexations of currently unsewered unincorporated area residents have also been incorporated into the EIS projections.

The EIS sewage flow projections have also tried to account for state legislation enacted during 1976. Assembly Bill 1395, which took effect in 1978, requires that all new residential construction (including hotels and motels) be equipped with water-conserving toilets. This requirement could reduce residential sewage generation rates by 10 to

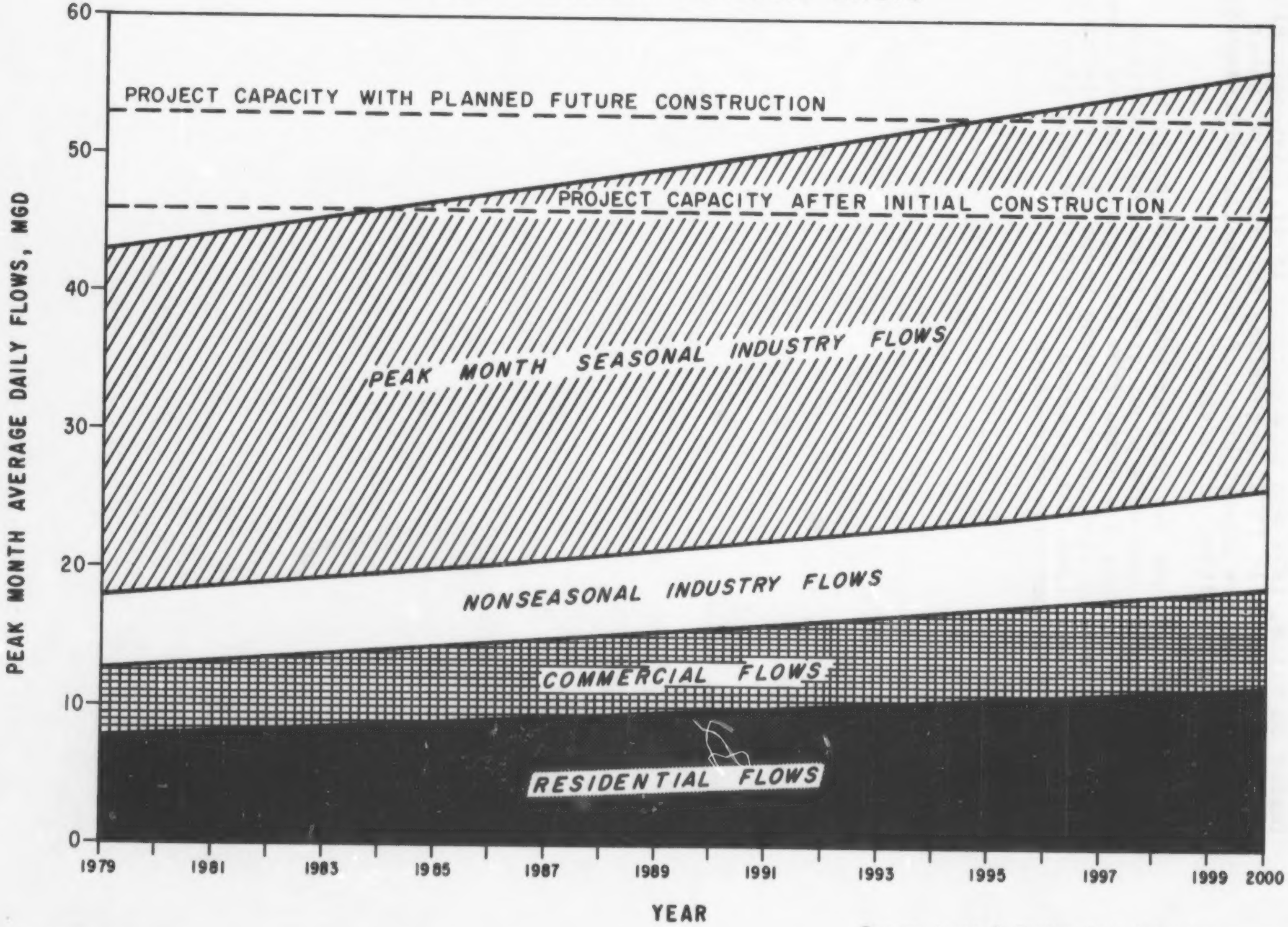
15 percent for new construction, additions and renovations (based on Milne, 1976 and Winneberger, 1974). Assembly Bill 3793, also passed in 1976, authorizes any municipal water supplier to require installation of reasonable water-saving devices as a condition of service.

Figures 3-2 and 3-3 present sewage flow projections based on the city and USSA population forecasts described in Chapter 5. Table 3-9 summarizes the population and sewage generation factors used in developing these flow projections. Table 3-10 summarizes the expected use of treatment plant capacity by various flow components.

FIGURE 3-2

PROJECTED SEWAGE FLOWS,

GG+A GROWTH FORECAST BASIS

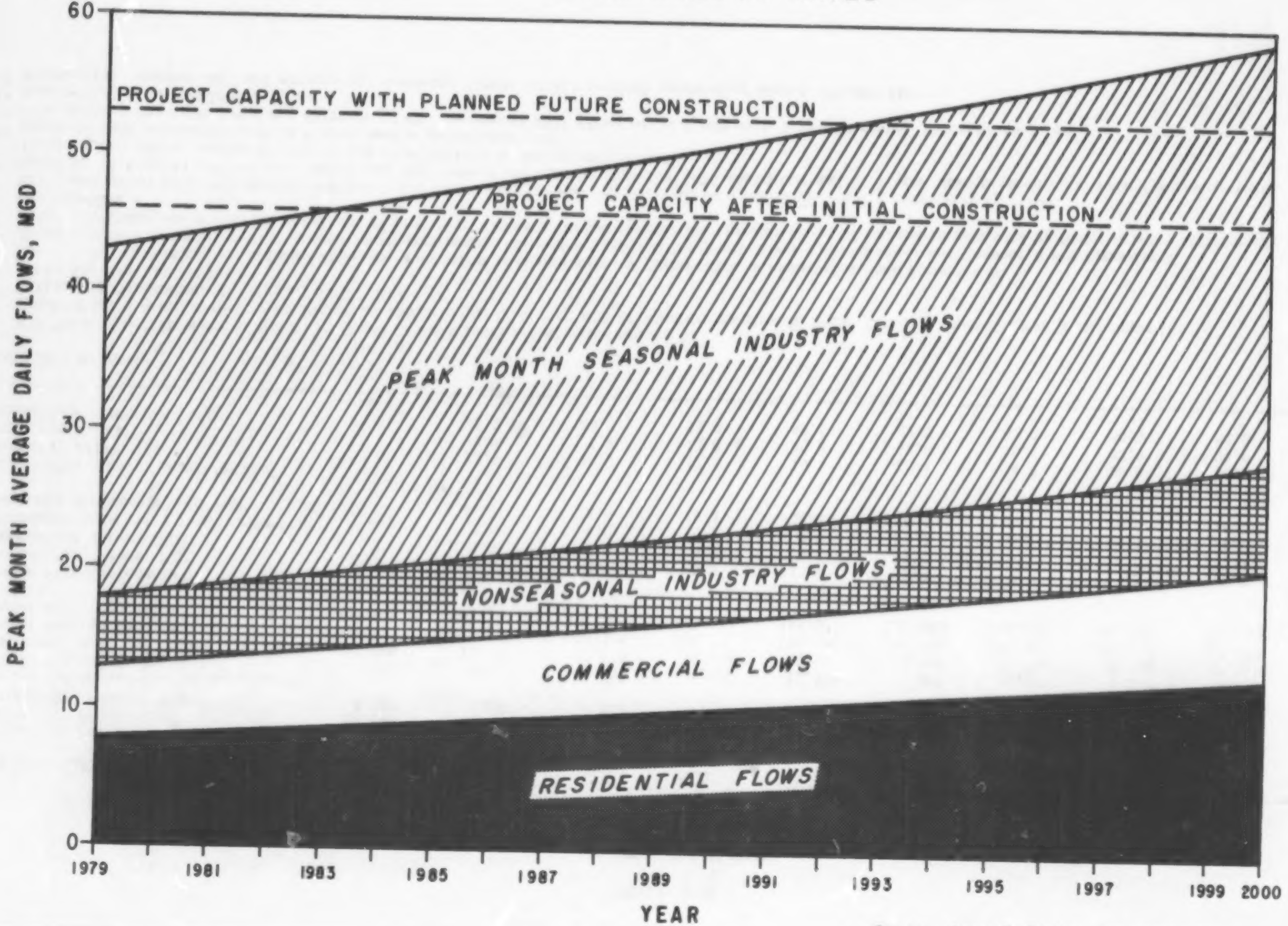


Source: Jones & Stokes Associates, Inc.

FIGURE 3-3

PROJECTED SEWAGE FLOWS,

E-150 GROWTH RATES



Source: Jones & Stokes Associates, Inc.

Table 3-9

PROJECTED SEWAGE FLOWS

Population and Sewage Flow Parameters	GG+A Forecast[1] 1980	1985	1990	1995	2000	E-150 Forecast[2] 1980	1985	1990	1995	2000
Population Factors										
1979 City Population[3]	99,200	99,200	99,200	99,200	99,200	99,200	99,200	99,200	99,200	99,200
Other 1979 Sewered Areas[4]	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Projected Annexations of Nonsewered 1979 Urban Area Residents[5]	667	4,002	7,337	9,837	12,337	667	4,002	7,337	9,837	12,337
Projected New City Growth[6]	1,866	11,735	22,568	35,934	50,768	2,465	15,740	30,748	47,813	67,118
Total Sewered Population	105,733	118,937	133,105	148,971	166,305	106,332	122,942	141,285	160,850	182,655
Total USSA Population[7]	129,642	141,195	153,589	167,042	182,202	131,833	146,009	161,709	179,163	198,500
Sewage Flow Components[8]										
Residential Flows, MGD[9]	7.9	8.8	9.7	10.8	11.9	7.9	9.0	10.2	11.5	12.9
Commercial Flows, MGD[10]	5.1	5.5	6.0	6.5	7.1	5.2	5.7	6.3	7.0	7.8
Nonseasonal Industry Flows, MGD[10]	5.1	5.5	6.0	6.5	7.1	5.2	5.7	6.3	7.0	7.8
Seasonal Industry Flows, MGD[11]	25.5	26.7	28.0	29.2	30.5	25.5	26.7	28.0	29.2	30.5
Sewage Flow Subtotals and Totals[8]										
Domestic Flows, MGD[12]	13.0	14.3	15.7	17.3	19.0	13.1	14.7	16.5	18.5	20.7
Base Flows, MGD[13]	18.0	19.8	21.7	23.8	26.2	18.2	20.5	22.9	25.6	28.5
Total Peak Month ADF, MGD	43.5	46.5	49.7	53.0	56.6	43.7	47.2	50.9	54.8	59.0

NOTES AND SOURCES:

[1] EIS "base case" forecast prepared by Gruen Gruen + Associates; see Chapter 5.
[2] Gruen Gruen + Associates extrapolation of the California Department of Finance countywide E-150 forecast; see Chapter 5 and Appendix A.
[3] California Department of Finance, 1979.
[4] Jenks and Harrison, 1976.
[5] Jones & Stokes Associates interpolation of annexation estimate made by Gruen Gruen + Associates, see Appendix A.
[6] Jones & Stokes Associates calculation using population forecasts prepared by Gruen Gruen + Associates, see Chapter 5 and Appendix A.
[7] USSA = ultimate sewer service area; see Figure 5-5. Jones & Stokes Associates interpolation of forecasts prepared by Gruen Gruen + Associates; see Appendix A.
[8] All flows given on a peak month, average daily flow basis in MGD (million gallons per day). ADF = average daily flow.
[9] Based on 74.6 gpcd (gallons per capita per day) sewage generation rate for 1979 residents and 64.5 gpcd sewage generation rate for new growth (lower flows due to mandatory use of low flow toilets in new construction).
[10] Based on USSA population and 39.2 gpcd sewage generation rate.
[11] Flow projections from Jenks and Harrison, 1976; estimated 1977 flows of 24.7 MGD with 0.25 MGD annual increase in flows.
[12] Residential plus commercial flows.
[13] Residential, commercial, and nonseasonal industry flows; equals 8-month noncanning season average flows.

Table 3-10. Expected Use of Available Capacity
By Flow Components

Flow Component	Peak Month Average Daily Flow, MGD				Percent Utilization Of Cumulative Capacity Increase	
	Projected 1979 Flow	Existing Plant Capacity	Capacity with Initial Construction	Capacity With Planned Future Construction	Initial Construction	Planned Future Construction
Residential flows	7.7	8.0	8.6	10.8	28.6%	30.8%
Commercial flows	5.0	5.2	5.5	6.5	14.3%	14.3%
Subtotal, domestic flows	12.7	13.2	14.1	17.3	42.9%	45.1%
Nonseasonal industry flows	5.0	5.2	5.5	6.5	14.3%	14.3%
Subtotal, base flows	17.7	18.4	19.6	23.8	57.1%	59.4%
Seasonal industry flows	25.2	26.5	25.6	29.2	42.9%	39.6%
Total flows	42.9	43.9	46.0	53.0		

SOURCE: Based on flow projections summarized in Table 3-9.

Chapter 4

GROWTH INDUCEMENT ROLE OF THE PROJECT

One of the primary issues in the development of major public works facilities is the growth inducement role of the developed project; that is, whether the completed facility will accelerate or augment the growth that would have occurred had it (the facility) not been developed. This chapter explores the issue of growth inducement for the proposed wastewater facilities improvements.

Growth Inducement Roles of Community Facilities

Regional Growth Inducement Roles

That the capital facilities of a community can function as an influence on growth has not always been true, but neither is it a new concept. Before the idea of sanitation had precipitated the use of piped water supply and waste disposal systems and changes in common modes of transportation had made paved streets more useful than unpaved ones, there was neither any pressing need for the capital facilities we now regard as mandatory nor, consequently, any reason why their presence or absence would influence growth. As the urban environment has evolved, however, the adequate provision of these facilities has become standard, and it has become one of the keys to accommodating or deterring new growth.

If standards for the provision of capital facilities are in effect, then the possibility of future growth depends on whether the adopted standards are met. For example, if residential development is required to be connected to sewer lines, then the presence of sewer trunk lines and a wastewater treatment plant with available uncommitted capacity will allow growth to continue, while the absence of such facilities will effectively stop growth until (or unless) additional capacity is installed. In some communities restrictions on capital facilities improvements or expansion have been imposed in recognition of this relationship and its implications for other environmental problems; for example, the Regional Water Quality Control Boards have been known to impose cease and desist orders on wastewater systems in places where water quality standards have been violated.

The ability of capital facilities - in this instance, wastewater treatment facilities - to accommodate growth should not be considered an ability to precipitate it in the absence of other stimuli. While it is possible to cite numerous examples of situations where residential, commercial, and industrial growth have taken advantage of existing facilities to locate at a given site, it must also be remembered that in the absence of other stimuli - e.g., demand for residences in a certain city, existence of a strong retail market, presence of advantageous industrial location and support facilities - the availability of wastewater treatment capacity would not precipitate development. Thus, the capacity should be viewed as a necessary but not sufficient condition for growth. (The examination of the economic base undertaken for the economic forecast indicates that Modesto does, in fact, have the stimuli needed to encourage growth; see page A-35ff.)

On the other hand, the absence of wastewater treatment capacity may well be sufficient as a deterrent to growth. A good example is Ceres' decision to discourage future development of wet industries within the city by not providing the waste treatment capacity those industries would need.

Subregional Growth Inducement Roles

While capital facilities cannot stimulate regional growth, they can act to channel the location and timing of growth within a region according to their size and the sequence in which they are provided. The distinction here is between causing growth and arranging the growth that occurs; while capital facilities cannot do the former, they are of major importance in the latter.

Measuring Growth Inducement

As noted above, the inducement of growth is the stimulation of a faster pace or greater amount of growth than would otherwise have occurred. The "amount that would otherwise have occurred" may be described in a *base case* forecast, which assumes that a likely or most probable set of conditions will prevail throughout the study period. In some cases, where there is a clearly observable trend or widespread general agreement about a trend - e.g., the average household size is decreasing - that trend is adopted as the likely condition. In other cases, where there is no clear trend, no widespread agreement or no good data - e.g., labor force participation by household heads or proportion of out-commuters - current conditions are assumed to apply in the future. One important assumption which should be noted specifically is that there will be enough wastewater treatment capacity and enough land available for development to accommodate the growth stimulated by continuing economic development.

The base case approach provides the community with a clear basis on which to evaluate the potential effects of future actions by presenting a scenario of the conditions which will result if no change is effected to alter current trends and conditions. Base case forecasts of economic population and housing growth for the EIS socioeconomic study area and the City of Modesto are developed in Appendices A and B and summarized in Chapter 5.

Growth Accommodated By the Proposed Project

Amount of Growth

As discussed in Chapter 3, the proposed project will initially provide a net capacity increase of 2.1 MGD while simultaneously providing the basis for a subsequent 7 MGD capacity increase at relatively moderate cost (probably 5-10 percent of the cost of initial project construction). Thus, this EIS addresses growth accommodation by both initial and planned future construction projects.

Table 4-1 indicates the extent of new city population growth accommodated under various assumptions as to growth rates, annexation of existing but unsewered area residents, and increases in seasonal or nonseasonal industry flows. Figure 4-1 indicates the time frame for utilization of project capacity under these various assumptions. As noted in Chapter 3, several of the assumptions used to develop the EIS flow projections differ from those used in the 1976 project report. Unlike the project report, this EIS has incorporated an estimate of flows from currently unsewered urban area residents who will become connected to the city sewer system in the future. The EIS also uses different procedures to estimate sewage flows from commercial and nonseasonal industrial areas, and slightly different sewage generation rates.

The 1976 project report indicates that initial construction would serve 17,900 new (post 1979) residents while planned future construction would serve a cumulative total of 45,000 new residents. The "no annexations" scenario under GG+A growth rates are the most comparable set of values on Table 4-1. The differences between the EIS and project report analyses are due primarily to the procedures used for projecting commercial and nonseasonal industry flows. The procedures used in this EIS result in commercial and nonseasonal industry flow projections which are about 20 percent greater than those used in the project report.

Table 4-1

NEW CITY RESIDENTS ACCOMMODATED BY PROJECT CONSTRUCTION UNDER ALTERNATIVE CITY CONTROLS ON FLOW SOURCES

Flow Component Control Policy	GG+A Growth Rates		E-150 Growth Rates	
	Initial Construction	Planned Future Construction	Initial Construction	Planned Future Construction
"Base Case" Conditions	10,100	35,900	11,300	40,000
No Annexations	10,900	39,100	12,100	43,200
No Annexations and No New Seasonal Industry Flows	20,300	68,800	20,300	68,800
No Annexations, No New Seasonal Industry Flows and No New Nonseasonal Industry Flows	28,800	96,500	28,800	96,500

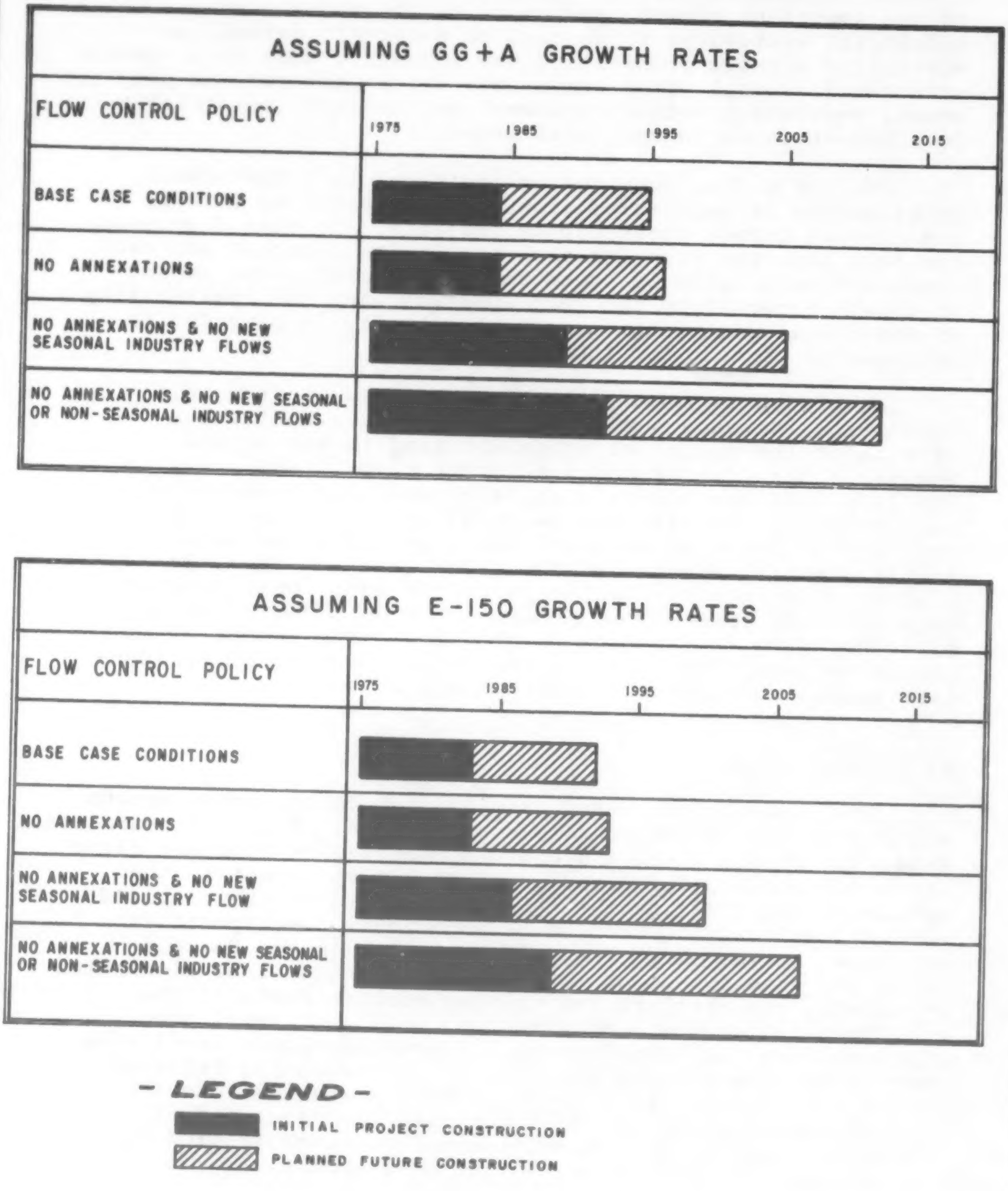
Notes and Sources:

Values calculated by Jones & Stokes Associates from annual and monthly flow projections using procedures summarized in Table 3-9. Treatment plant capacity assumed to be 46.0 MGD following initial project construction and 53.0 MGD following planned future construction.

The "Base Case" conditions include all the flow component assumptions outlined in the footnotes to Table 3-9. Growth accommodation under other flow component control scenarios calculated by making appropriate changes in this projection methodology.

FIGURE 4-1

TIME FRAME FOR USE OF AVAILABLE CAPACITY



SOURCE: JONES & STOKES ASSOCIATES CALCULATIONS

As is obvious from Table 4-1, a prohibition on new industrial flows would increase the amount of residential and commercial growth accommodated by project construction. But it should also be recognized that new industrial development is one of the important growth generators in the Modesto area. While industrial wastewater flows can, to a certain extent, be controlled without prohibiting new industry, such flow control measures (internal water recycling; water conservation programs; separate treatment systems) may inhibit industrial development rates in the local area.

Chapter 5 discusses the agricultural land conversion implications of population growth accommodated by initial and planned future construction projects. In that discussion, the full capacity year for each population forecast and each construction program is presented; in addition, the amount of growth forecast by the year 2000 assuming the availability of additional wastewater treatment capacity is provided to establish a context for the project.

The growth in urban area likely to result from this population increase may be expected to have noticeable effects on the amount of urbanized land in and around Modesto. The City of Modesto inventoried 12,087 acres in its 1976 land use survey area developed into residential, commercial, industrial and related, and park/public uses. The City of Ceres inventoried 990 acres in those uses within its city limits in 1976. The land use forecast presented in Chapter 5 anticipates the additional development of 7,835 gross acres between 1979 and 2000, of which 6,440 would be in the City of Modesto. (The amount of increase may vary depending on the actual density of residential development experienced; see Table 5-7.)

Pattern of Growth

The base case forecast assumes that future urban growth would continue according to current trends. Expected residential expansion in the north and east, commercial development along the major thoroughfares and industrial development in the southeast are consistent with the structure of the proposed project, which will accommodate additional development in all areas of the city. Capacity problems in the Emerald Trunk and existing upper level pump station will be eliminated by serving the northern and extreme western parts of the city through the new West Trunk and new lower level pump station. Capacity problems at the existing lower level pump station will be temporarily, but not permanently, relieved by the interconnection with the new pump station. As the northern and western areas of the city are developed, the available capacity in the new lower level pump station will increasingly be used to serve that development.

While the overall 25-year development pattern will probably not be affected by the wastewater facilities plan, the timing of development at various locations will be affected by the schedule according to which new sewer trunk lines are installed. For example, the first priority extension of the Yosemite Trunk (to Frazine Road) will promote growth in the southeast area of Modesto; the Sonoma Trunk, originally scheduled to be operational by August 1978, and the Lakewood Trunk would allow northeastern growth to continue.

Area Growth Under No-project Conditions

A decision by the City of Modesto not to proceed with any of the proposed facility improvements would greatly constrain future development in Modesto. Inadequate facility capacity could result in the city's imposing a moratorium on new connections to the system. Even if the city did not take such action, the present facility would continue to violate the discharge requirements established by the Regional Water Quality Control Board (RWQCB). Continued violation could lead to RWQCB to impose fines or a ban on new connections to Modesto's sewer system.

If federal funding is not provided for the proposed project, it is likely that the city would finance some facility improvements on its own. The city has already approved two major interceptor projects (the West Trunk and Dryden interceptors) which will necessitate construction of a new pump station. While the city has not thoroughly evaluated its options for such a situation, available funds would probably be used for improvements at the primary plant. Pump station and sludge handling facilities would probably take priority. It is unlikely that the city could finance the required storage pond and pipeline facilities for irrigation reuse of the effluent (Campbell, pers. comm.). Thus, river discharge (with some effluent reuse on the Chase property) would continue. Discharge requirements would continue to be violated. The city would then face the prospect of fines and/or a connection ban imposed by the Regional Water Quality Control Board. If the canning industries were to remove their discharges from the city system (by providing their own treatment or irrigation systems), the city might be able to meet discharge requirements; this, however, is by no means certain.

Chapter 5

URBANIZATION OF PRIME FARMLAND

Introduction

A major issue addressed by this EIS is the projected conversion of prime agricultural land to urban uses which will be made possible by the proposed expansion of the Modesto wastewater facilities. The EIS is required to consider this issue pursuant to the directive of the U. S. Council on Environmental Quality (CEQ) stating that "highly productive farmlands" are among those "important historic cultural and natural aspects of our national heritage" which it is federal policy to preserve:

> "Efforts should be made to assure that such farmlands are not irreversibly converted to other uses unless other national interests override the importance of preservation or otherwise outweigh the environmental benefits derived from their protection" (CEQ, 1976).

Regulations of the U. S. Environmental Protection Agency (EPA, 1975) implementing the National Environmental Policy Act of 1969 require preparation of an EIS when implementation of a facilities plan may result in changes that would "adversely affect significant amounts of prime agricultural land or agricultural operations on this land".

The implementation of the Modesto wastewater facilities plan will allow conversion of prime agricultural lands in Modesto and the surrounding area to urban uses. This chapter addresses the significance of that impact by evaluating the importance of prime farmlands from the national, state and local perspectives. To this end, an overview is presented of the amount and character of prime farmland in the United States, in California and in Stanislaus County. Variations in the level of crop acreage and crop yield are discussed briefly and data are presented on the conversion of farmland to nonagricultural uses.

The chapter concludes with an estimate of the projected conversion to urban use of prime farmland in and around Modesto. It then presents an inventory of agricultural land retention measures and a discussion of their application both in theory and in practice. Finally, the measures Modesto has adopted or plans to adopt to mitigate the conversion of prime agricultural land associated with the wastewater facilities expansion project are presented.

Perspective on the Significance of Prime Farmland

Prime Farmland in the United States

The Character of the Prime Farmland Resource. Prime farmland is land suitable for farming or silviculture, possessing attributes established by the Soil Conservation Service (SCS) of the United States Department of Agriculture (USDA): "Soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods" (Lee, 1978).

Prime farmland - or, more technically, prime agricultural land - may be found in rural or in urban settings; it may be used for crops, for pasture or for other agricultural purposes; it may not even be farmed at a given point in time but may instead be in forest use or encumbered by buildings, roads or water impoundments. Basically, it includes all those lands - whatever their current uses - which have soil, climate and water availability characteristics that permit the production of "relatively more food with less erosion and with lower demand for fertilizer, energy and other resources" than nonprime land (CEQ, 1977).

In this EIS, the SCS definition presented above is the applicable definition wherever the term "prime farmland" and "prime agricultural land" are used except where data from sources using different definitions are presented; in those cases, definitional differences are identified.

It should be noted that prime farmland is not the same as farmland, because some farmland is not prime; neither is it the same as rural land, because not all rural land meets the criteria of prime agricultural land (in fact, very little does). The term cropland includes land devoted to the cultivation of field crops, row crops, orchards and vineyards. While not all cropland is prime farmland, much of it is, because crop production depends much more on soil, climate and water availability conditions than does the production of other kinds of agricultural products (such as livestock and poultry). For this reason, a reduction in the amount of cropland is sometimes interpreted as indicating a decline in the amount of prime farmland available for production.

Estimates of the Amount of Prime Farmland. In 1975 the SCS inventoried 384 million acres of prime farmland in the U. S. Of this total, 250 million acres were in cropland, 77 million acres were in pasture and range, 43 million acres were in forest land, and 14 million acres were in miscellaneous other uses (Dideriksen, 1977). The 1975 inventory updates an earlier (1967) inventory of SCS, which had addressed the question of how much potential cropland existed in the U. S. - land not in crop production, but with high or medium potential for crop cultivation. The 1967 inventory counted 266 million acres of potential cropland, but the 1974 inventory reduced this estimate to 111 million acres, of which only 15 million acres can readily be brought into cultivation. Constraints that preclude bringing the remaining 96 million acres of high/medium potential cropland into cultivation include dense forest cover, seasonal high water tables and high erosion factors (Dideriksen, 1977). It should be noted that the potential cropland figures encompass both prime and nonprime lands which can be converted to cropland. The prime land component of these figures is already accounted for in the total national supply of 384 million acres of prime farmland.

The current national supply of prime farmland in crop production is therefore about 250 million acres; another 15 million acres of prime agricultural land could be brought into immediate crop production without constraints and another 9 million with minimal constraints. The remaining 87 million acres of prime and nonprime land with a high or medium potential for conversion to cropland represents a longer run reserve of cropland resources.

Trends in Agricultural Land Conversion. National land use patterns have remained fairly stable in the decades since 1910, as Table 5-1 shows. As in 1950, cropland in 1974 still comprised approximately 1/5 of the total land use in the country.

Rural Land Use Changes, 1967 to 1975. Land use changes between 1967 and 1975 are presented in Figure 5-1. Total cropland and total pasture and rangeland both declined; forest land increased. The small circle at the lower left of Figure 5-1 represents land which had been in rural use in 1967, but which by 1975 had either been inundated (for reservoirs) or converted to urban use. A total of 24 million acres had passed out of the rural land supply into urban or water use in the 8-year period.

Cropland Acreage Change, 1967 to 1975. Approximately 78 million out of 431 million acres of cropland (defined in the 1975 survey as land in tillage rotation, orchards, and land formerly in such uses) were converted to noncropland uses during the 1967-75 period. Most of the converted cropland acreage was put to less intensive agricultural use

Table 5-1

LAND UTILIZATION, UNITED STATES, SELECTED YEARS 1910-1974

Major Land Uses (millions of acres)	1910	1920	1930	1940	1950	1959	1969	1974[1]
Cropland Used for Crops[2]	330	368	382	368	377	359	333	363
Idle Cropland	23	34	31	31	32	33	51	20
Cropland Used Only for Pasture	84	78	67	68	69	66	88	84
Grassland Pasture[3]	693	652	652	650	631	633	604	598
Forest Land[4]	600	602	601	608	601	728	723	718
Special Uses[5]	NT	NT	NT	NT	NT	147	174	184
Other Land	174	170	171	179	194	305	291	297
Total Land Area[6]	1,904	1,904	1,904	1,904	1,904	2,271	2,264	2,264

NT = not tabulated.

[1] Preliminary.

[2] Cropland harvested, crop failure, and cultivated summer fallow.

[3] Grassland and other nonforest pasture and range.

[4] Excludes reserved forest land in parks and other special uses. Includes forested grazing land.

[5] Includes urban and transportation areas, Federal and State areas used primarily for recreation and wildlife purposes, military areas, farmsteads, farm roads and lanes, and misc. other uses.

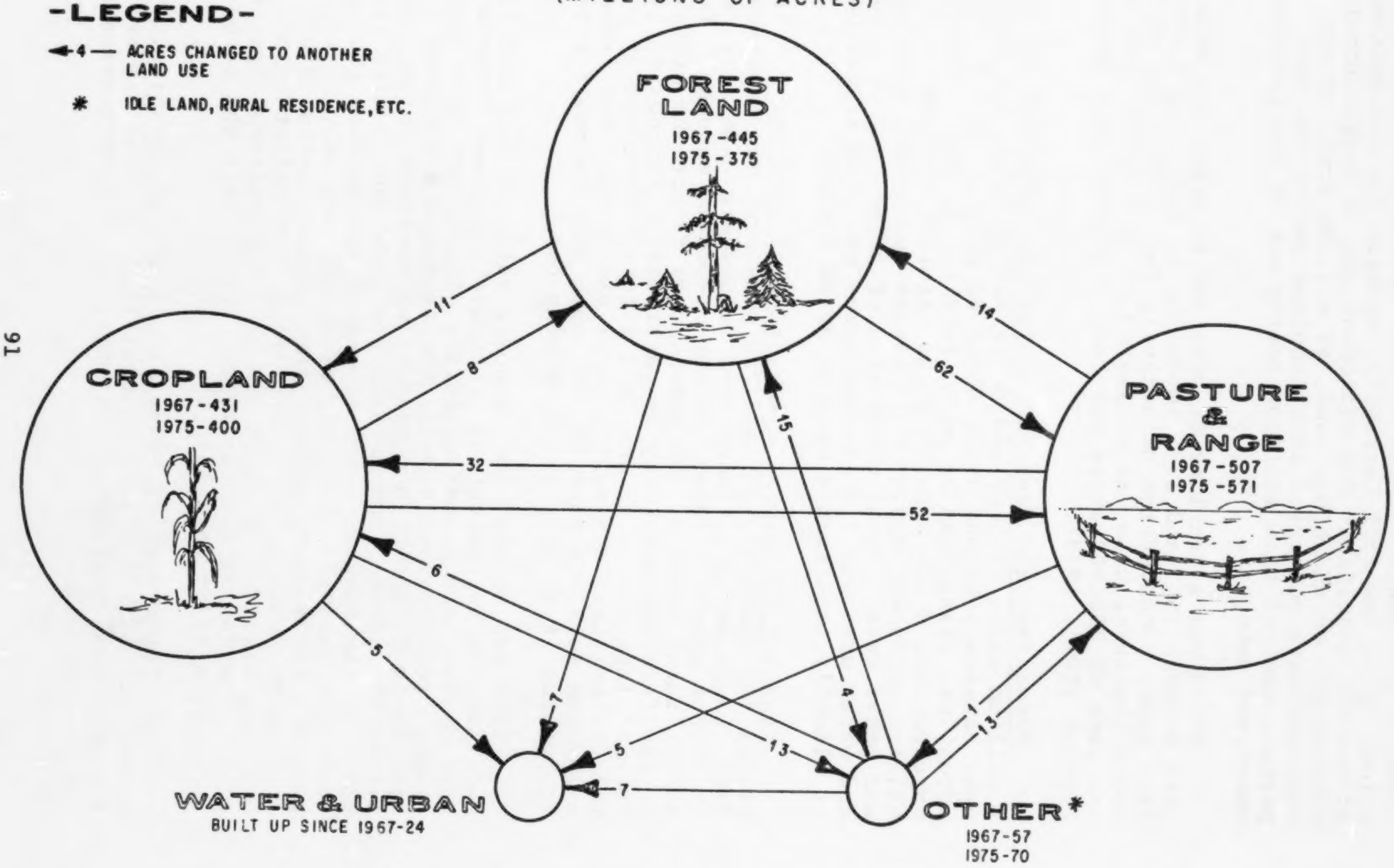
[6] Remeasurement and increases in reservoirs account for changes in total land area except for the major increase in 1959 when data for Alaska and Hawaii were added.

Source: USDA, 1977

FIGURE 5-1

LAND USE CONVERSIONS, 1967 TO 1975 IN THE UNITED STATES

(MILLIONS OF ACRES)


-LEGEND-
4 — ACRES CHANGED TO ANOTHER LAND USE
* IDLE LAND, RURAL RESIDENCE, ETC.
FOREST LAND
1967-445
1975-375
CROPLAND
1967-431
1975-400
PASTURE & RANGE
1967-507
1975-571
WATER & URBAN
BUILT UP SINCE 1967-24
OTHER*
1967-57
1975-70
11
8
14
62
32
52
6
15
5
7
4
13
5
1
13
7

REDRAWN FROM: DIDERIKSEN, 1977

(pasture and range). Much of this change is attributed primarily to low soil fertility, erosion and the existence of terrain unsuitable for efficient use of agricultural machinery. On the other hand, 49 million acres of non-cropland were converted into cropland during the same period, most of that addition coming out of the pasture and rangeland category.

There was a net loss of cropland to urban and water uses between 1967 and 1975 amounting to more than 5 million acres. Conversion of actively farmed cropland to nonagricultural uses was estimated to have taken place at the rate of 700,000 acres per year (Congressional Research Service [CRS], 1978).

Prime Farmland Conversion, 1967 to 1975. Of the over 5 million acres of cropland converted to urban and water uses between 1967 and 1975, about 83 percent (4.5 million acres) was classified as prime farmland by SCS. Other irreversible conversion of prime farmland involved 2.9 million acres withdrawn from pasture and range, forests and other uses. Total conversion of prime land to urban and water uses was 7.4 million acres over the 8-year period, or slightly less than a million acres a year.

Economic Pressures on Agricultural Landowners. Rising prices for agricultural land can pose economic problems to farm owners because higher land values are generally reflected in higher property taxes, an out-of-pocket expense. In agricultural areas at the urban-rural fringe the pressure on the farmland owner may be particularly strong, as land buyers' interest is in the land's future development potential rather than its agricultural use value. The farmer can often sell his land for far more than he could afford to pay for it to keep it in farming use.

This gap between the economic value of farmland in agricultural use vs. potential urban use can cause diminishing productivity and premature idling of cropland near urban areas. Anticipating a sale, the farmer discontinues investment in improvements and reduces maintenance costs. The farmer who decides not to sell may face continually rising costs at the edge of urban expansion approaches. He becomes increasingly adversely affected, not only by rising property taxes, but by other incidental impacts of urban development such as road congestion, air pollution and possibly limits on certain kinds of agricultural operations. Often, the farmer eventually chooses to sell the property and relocate (Snyder, 1976).

The Importance of Prime Farmlands Preservation. The conversion of prime agricultural land to urban use is, for all practical purposes, irreversible. The conversion of prime lands to urban uses reduces the range of environmental benefits derived from the land, and represents a potential reduction in the nation's food and fiber production capabilities.

The Environmental Case for Preserving Farmlands. Given good farm management and soil conservation practices, a number of environmental benefits are inherent in the use of land for agricultural purposes. Some of the more readily identifiable benefits (EPA, 1978a) including the following:

Watershed Protection. Open lands, such as farms, help maintain local water supplies by absorbing precipitation and transferring it to the groundwater system; protect the hydrologic integrity of watersheds through the control of storm water runoff and sediment damage; protect aquifer recharge areas; and provide buffers for water supply and other natural areas.

Insulation of Environmentally Sensitive Areas from Incompatible Uses. Agricultural uses can provide both a buffer and an economically viable land use for areas subject to environmental hazard conditions (i.e., flood-prone areas, subsidence areas, wildfire hazard areas, etc.). Ecologically sensitive areas can also be buffered by farmlands, although agricultural activities may themselves pose a threat to some of these areas.

Provision of Wildlife Habitat. Agricultural areas often contain important elements of wildlife habitat. In the eastern U. S., these habitat elements often involve remnants of original habitat types which have been largely replaced by cultivated areas. In the more arid western U. S,, stock ponds and irrigation systems can provide important water sources for wildlife. Fallow areas, orchards and unharvested grain crops are also important to wildlife in many areas. But in a historical perspective, agriculture has been the major source of habitat destruction, both in this country and elsewhere in the world. Modern farming practices provide very little wildlife habitat in areas of intensive cultivation (National Academy of Sciences, 1970).

Removal of Air Pollutants. Agricultural activities (cultivation, pesticide use, agricultural burning, etc.) contribute a variety of gaseous and particulate pollutants to the atmosphere. But uptake, absorption, and physical impaction on vegetation are major removal mechanisms for many air pollutants. Particulates, sulfur dioxide, nitrogen dioxide and ozone are all subject to significant removal rates when polluted air comes in contact with vegetation. Carbon monoxide and nitric oxide, on the other hand, are not removed by contact with vegetation.

Depending on pollutant concentration, the process of pollutant removal by vegetation may lead to reduced plant growth or death of plant tissues (Hill, 1971; Bennett and Hill, 1973).

The Case for Preserving Prime Lands as Reserve Capacity for Food and Fiber Production. Each increment of this highly productive or potentially productive land which is urbanized diminishes our future agricultural resource base. The annual losses, accumulated over decades, can make a sizeable dent in the total supply, and this is happening at a time when at least some observers suggest that our future food and fiber needs, domestic and export, may well exceed the production levels which a constant or declining agricultural land base can support. Future yields, future domestic agriculture needs, future export demands and the ability of American agriculture to weather inflation, land speculation and other economic pressures are some of the uncertainties the future holds.

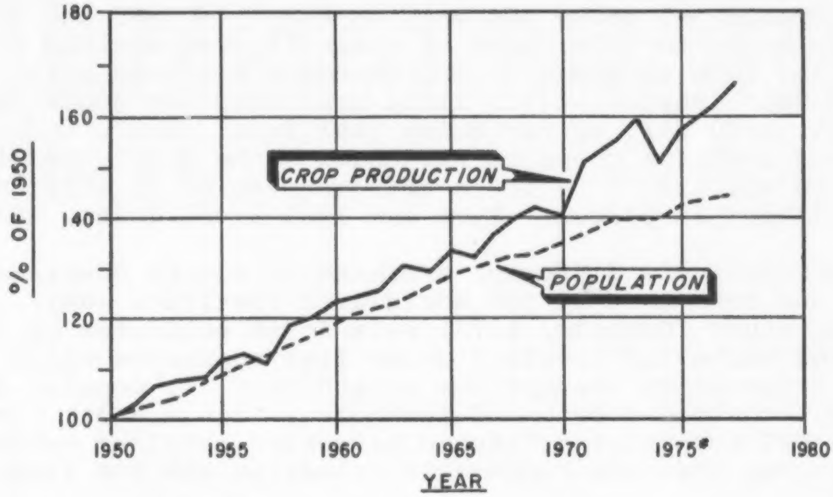
Uncertainty About Future Increases in Crop Yields. "Yield" is the amount of agricultural output which can be obtained from a given unit of land. Yields from U. S. agriculture have risen steadily over time, more rapidly than domestic population growth as Figure 5-2 shows for the period since 1950.

Technological advances have contributed to an increase in yields of about 60 percent and in total output by 160 percent from 1949 to 1975 (Figures 5-2 and 5-3). These increases took place during a period when the acreage of cropland used for crops decreased by some 20 million acres (5 percent). A major source of this increased agricultural capacity has been the development and adoption of new techniques in the production and processing of food and fiber, such as synthetic fertilizers and hybrid plants.

There is considerable doubt that historical productivity gains can continue indefinitely into the future. Constraints on the adoption of new technology such as restrictions on the use of pesticides, higher energy and energy-related input costs, as well as the necessity for cultivation of less productive lands due to the loss of better lands to urban and other uses, may restrict future yield increases (Skolds and Penn, 1977). In balancing the environmental and economic costs against the implementation of new technologies, it is expected that yields will increase, but at a slower rate than that experienced in the past two decades. In view of diminishing rates of increases in yields, the supply of land itself reemerges as the most important variable in estimating potential future agricultural output.

FIGURE 5-2

FARM OUTPUT & U. S. POPULATION



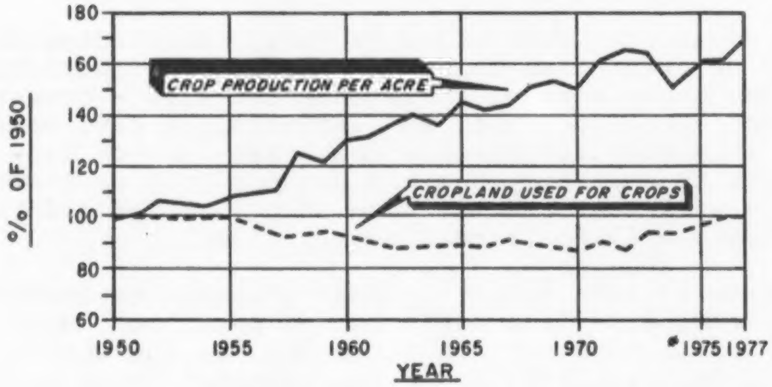
* PRELIMINARY

NOTE: INDEX OF FARM OUTPUT IS CALCULATED BY THE CONSTANT PRICE-WEIGHT METHOD AND INCLUDES ALL 50 STATES.

COMPILED FROM COTNER, 1975 & USDA, 1977

FIGURE 5-3

CROP PRODUCTION PER ACRE & CROPLAND USED FOR CROPS



* FORECAST

COMPILED FROM COTNER, 1975 & USDA, 1977

Future Domestic Needs for U. S. Food and Fiber Products. There is considerable disagreement among various forecasts of future cropland needs in the U. S. This can be illustrated by comparing the conclusions of two recent studies.

The existing cropland base is in the range of 400 million acres (Table 5-1 shows 384 million acres in 1969 and 383 million acres in 1974; both of these figures include cultivated and idle cropland). The Economic Research Service (ERS) of the USDA (Snyder, 1976) finds that cropland needs for the year 2000 will be far below that level (Table 5-2). Cropland used for crops is projected to be about 298 million acres in the year 2000 for a net decrease of 35 million acres (about 10 percent) from the 1969 level (USDA, 1974).

A strikingly different estimate of future cropland needs has been made by the Worldwatch Institute (WWI). The WWI study (Eckholm, 1976) sets forth estimates of the need for harvested cropland under five scenarios which reflect alternative assumptions regarding U. S. population growth, economic growth and technology (Table 5-3). In all of the WWI scenarios projected harvested cropland needs are much higher than the comparable values in the ERS study.

The Worldwatch scenario most demanding of cropland - the scenario assuming high population growth, high economic growth and low application of technology - would require a total of 471 million acres of cropland in the year 2000, which is only 7 million acres below the nation's long-term cropland capacity of 478 million acres (Lee, 1978). At the rate of increase in cropland requirements implied by the Worldwatch second scenario, all of the high potential cropland in the U. S. would be required for production by the year 2007. All of our prime agricultural land, in other words, would be in use, and there would obviously be cause for concern as to the nation's ability to meet any additional food and fiber needs.

The divergent conclusions of these two studies illustrate the uncertainties in the future of U. S. agriculture. Assumptions about some of these uncertainties - domestic population, economic growth and technology - have been made explicit in Worldwatch's scenarios. ERS has not made its assumptions as explicit, but has assumed that technological innovation will continue to increase production and that export demand will not significantly alter.

In view of such uncertainties, accurate estimation of future agricultural land needs is not possible. What is clear is that, under certain circumstances not wholly implausible, our supply of prime agricultural lands could be

Table 5-2

PROJECTED USES OF LAND IN THE CONTIGUOUS 48 STATES IN 1980 AND 2000 (WITH 1949 AND 1969 HISTORIC DATA)

Land Use	1949	1969	1980	2000
		(millions of acres)		
Total cropland	387	333	320	298
Cropland harvested	*352*	*286*	*292*	*272*
Forest and woodland	601	603	591	578
Pasture, range, and other agricultural land	768	767	771	782
Urban and related	42	60	66	81
Other special uses and miscellaneous uses	106	134	149	158
Total land area	1,904*	1,897*	1,897	1,897

* Change due to remeasurement

NOTE: Figures are for the contiguous 48 states; only the 1949 figures correspond to those in Table 5-1 (for 1950) because the data in Table 5-1 include Alaska and Hawaii from 1959 on.

Source: Snyder, 1976

Table 5-3

U. S. CROPLAND NEEDS IN THE YEAR 2000 UNDER FIVE ALTERNATIVE DEVELOPMENT SCENARIOS

		Actual	Year 2000 Scenario				
		1970	1	2	3	4	5
Assumptions	Population (millions)	204	321	321	321	266	266
	Economic growth	---	High	High	Low	High	Low
	Technology	High	High	Low	Low	High	Low
Outcome	Harvested cropland (million acres)[1]	344	391	438	436	359	390
	Cropland not harvested[2]	96	31	33	32	51	32
	Total cropland	440	422	471	468	410	422

[1] Includes pasture in cropland.

[2] Includes about 30 million acres required for failure and summer fallow, the remainder being unused.

SOURCE: Eckholm, 1976

fully in use early in the 21st century; a backup supply of agricultural lands will exist, to be sure, but of lesser quality, involving higher production costs, lower yields and rapidly rising domestic food prices. Loss of prime lands to urbanization poses a problem because such losses are irreversible and because the supply is finite. The cumulative effects of the alienation of these resources from agriculture may well pose a serious future problem for the nation.

Demand for Agricultural Exports. Thus far, the discussion of agricultural land requirements has focused on domestic food requirements; export levels have been assumed relatively stable. Significant increases in export demand would accelerate the events described in Worldwatch's second scenario and would increase the cropland need estimated in both the studies cited. Because the ERS estimate was published prior to the recent dramatic increases in U. S. agricultural exports, it probably does not fully reflect the potential future worldwide demand for U. S. agricultural products.

Recent experience - the 1974 world food shortage, for example - shows the relationship between export demand and U. S. domestic food prices and production levels. With shortages raising international prices for agricultural commodities, the federal government released almost all of the farmland retained under supply management programs (Cotner, 1975). But food prices nevertheless rose sharply; between 1972 and 1974, food prices rose over 30 percent while prices of all items (including food) rose less than 20 percent. With rising food prices, consumers have been forced to spend an ever increasing percentage of their income on food. Policies designed to preserve the productive land base would help insulate domestic consumers from price increases due to increased export demand.

A growing farm export market has had a favorable effect on the nation's balance of trade. Acreage harvested for agricultural export increased from 69 million acres in 1967 to 100 million acres, or 30 percent of the total acreage harvested, in 1975 (USDA, 1977). In 1977 the country suffered a $27 billion trade deficit, but agriculture had a net surplus of $10.6 billion (CRS, 1978). As inflation and a growing trade deficit erode the dollar's buying power, measures taken to preserve croplands will help ensure agriculture's ability to offset the increasing costs of imports.

Prime Farmland Preservation: A Growing National Concern. The issue of farmland depletion and particularly the irreversible conversion of prime farmland to nonagricultural use has prompted federal legislation designed to protect our agricultural land resources. Legislation proposed in the 95th Congress included the Agricultural Land

Retention Act (H.R. 11122) and similar Senate Bills, S. 1616 and S. 2757 (CRS, 1978). Essentially these bills would have provided funding to study agricultural land conversion and to make recommendations for possible modifications in federal land use policies to prevent the depletion of the nation's prime farmland. None of these bills was acted upon by the 95th Congress.

Prime Farmland in California

Agriculture in California's Economy. California's wide variety of quality soils, unique climatic conditions and abundant irrigation water permit the commercial cultivation of over 200 crops. The state produces 25 percent of all table food and 40 percent of all fresh vegetables and fruit consumed in the nation (Reed, 1977). Agriculture is one of California's major industries: an estimated $8.6 billion in cash receipts at the farm level generated approximately $45 billion or 24 percent of the state's aggregate output of $190 billion in 1975 (California Legislature, 1977a). Agricultural land use amounts to 36.1 million acres of the state's 100.1 million acres in 1975; however, most of the cash return from crops was derived from production on the 3.7 million acres of irrigated land in the state (California Department of Water Resources [DWR], 1974).

The Prime Farmland Inventory. California developed and applied a definition of prime farmland prior to the more recent definition developed by SCS for the national land inventory (see discussion earlier in this chapter of the SCS definition, p. 88). The California definition is spelled out in the California Land Conservation Act of 1965, and is referred to in this chapter as the "CLCA" definition. It is more inclusive than the SCS definition because it includes lands which return a gross revenue of $200 per acre, irrespective of their soil quality.

Table 5-4 sets forth estimates of the amount of prime agricultural land in California under both CLCA and SCS definitions. The more restrictive SCS definition results in an inventory of 9 million acres, 3.6 million acres less than the CLCA definition (Singer and Reganold, 1978).

Potential Prime Farmland. Potential prime farmland is defined as that land which has the capacity to be made prime (according to the CLCA definition) through normal agricultural investment and practices (California Office of Planning and Research [OPR], 1974). OPR estimates that there are 8 million acres of potential prime land in the state. In contrast, SCS estimates only 4 million acres, based on the acreage of presently nonirrigated Class I and Class II soils. Most of these lands are located in the Mojave Desert and the Owens Valley; the remainder are scattered in small parcels in coastal valleys. Only a small fraction of this acreage is found in the major agricultural areas of the state.

Table 5-4

CALIFORNIA PRIME FARMLAND INVENTORY

	Prime Farmland	Potential Prime Farmland	Total
Office of Planning and Research (CLCA[1] classification)	12.6	7.98	20.58
Soil Conservation Service (LIM[2] classification)	9.0	4.00[3]	13.00[3]

[1] CLCA definition includes all lands meeting at least one of the following criteria: (1) Class I and Class II soils as defined by SCS; (2) land that returned an annual gross value of not less than $200 per acre; (3) land qualifying for a rating of 80 to 100 in the Storie Index of Soil Classification; (4) land that supports livestock with an annual carrying capacity equivalent to at least one animal unit per acre, as defined by the USDA; (5) land planted in fruit or nut-bearing trees, vines, bushes or crops that have a nonbearing period of less than 5 years, and that will normally return $200 per acre per year (Hanson and Schwartz, 1976).

[2] U. S. Soil Conservation Service, 1977.

[3] Contingent upon water availability.

Source: Singer and Reganold, 1978

Trends in Agricultural Land Conversion. Past changes in California's agricultural land use are well known in both technical and popular literature. The Santa Clara Valley was a prime orchard area prior to 1950, yet from 1940 to 1970 over 40,000 acres of prime orchard land was taken out of production as population increased from 310,000 in 1950 to over 1 million in 1970 (Holloway, 1977). Since 1970, this trend has accelerated as approximately 24,000 acres of prime orchard land have been lost (Santa Clara County Department of Agriculture, 1977).

San Diego County's unique Mediterranean climate and fertile soils have made this area a leading producer of California specialty crops. But between 1950 and 1966, population pressure had forced the conversion of over 63,000 acres of prime farmland to urban uses (San Diego County, 1968) and the area has lost its former leadership position in citrus and nut production.

Generally, agricultural activities formerly located in the urban coastal counties have shifted to the San Joaquin Valley, where vast acreages have been brought into intensive cultivation through implementation of major irrigation projects. It is estimated that about 55,000 acres per year of land are being reclaimed for intensive crop production (OPR, 1974).

However, prime agricultural land is also being absorbed by continuing urban expansion at the rate of 20,000 to 25,000 acres per year (DWR, 1974). Projections by OPR indicate that urbanization of prime farmland during the 1974-85 period will average 50,000 acres per year, and 80,000 acres per year if potential prime land is also included. In view of the fact that DWR estimates of past prime farmland losses were about 25,000 acres per year, the OPR estimates of future losses show a considerable acceleration of this trend.

Future Prospects for California Agriculture.

Impediments to Reclamation of Additional Lands. The major impediment to the upgrading of potential prime land to prime land status is the lack of irrigation water supplies and a decrease in the amount of new water supplies available for agricultural use. Currently there is a gap between the supply of water and the demand, which agriculture is compensating for via groundwater overdrafting. New water projects would be needed to upgrade potential prime land to prime, and current prospects for construction of such projects are not favorable.

Less valuable agricultural lands - "marginal" lands - might also be brought into production if the long-term need warranted and if water were available. However, higher costs of production are incurred because these reclaimed marginal lands are less productive and require greater use of fertilizers, longer transport distances, and have lower yields over which to spread costs. Greater capital costs on these lands result from the need for more extensive water delivery systems, land and soil improvements and other fixed costs.

High capital costs required for development of new croplands in California are illustrated by experience in the Westlands development project in Fresno County, where subsidies approaching $2.5 billion in the next 40 years may be needed to bring only 600,000 acres into production (California Legislature, 1977b). The primary reason for the decrease in return for new farmland is that the optimum conversion sites for agriculture purposes have been used up, and the crop yields on marginal lands are not adequate to pay back the high construction costs of the needed water supply projects. These factors indicate that the small reserve of prime agriculture land and the low economic viability of new water projects reduces the feasibility of replacing lost prime land with lower quality marginal lands.

Projections of Future Agricultural Land Use. Projections by the DWR in 1974 of future water demands and the ability to meet these demands in the years 1990 and 2020 are summarized in Figure 5-4 and Table 5-5. High demand scenarios for irrigated land based on agricultural growth are represented by Alternatives I and II, and future agricultural water needs for these respective alternatives will exceed projected water supplies. If, however, either of the lower demand levels represented by Alternatives III and IV is realized, projected water supplies will be sufficient for agricultural use.

In all four scenarios total water demand would exceed dependable water supplies. The deficit would have to be made up by groundwater overdrafts, providing that such a degree of overdraft is technically and economically feasible.

The outcomes of the four scenarios could be significantly different from DWR's projections if urbanization expands at a faster rate or if new water supply facilities lag behind urban development more than expected. In fact, construction of a number of the water projects on which the DWR supply forecasts are based has been postponed, suspended or cancelled. The forecast of dependable water supplies may consequently be too high.

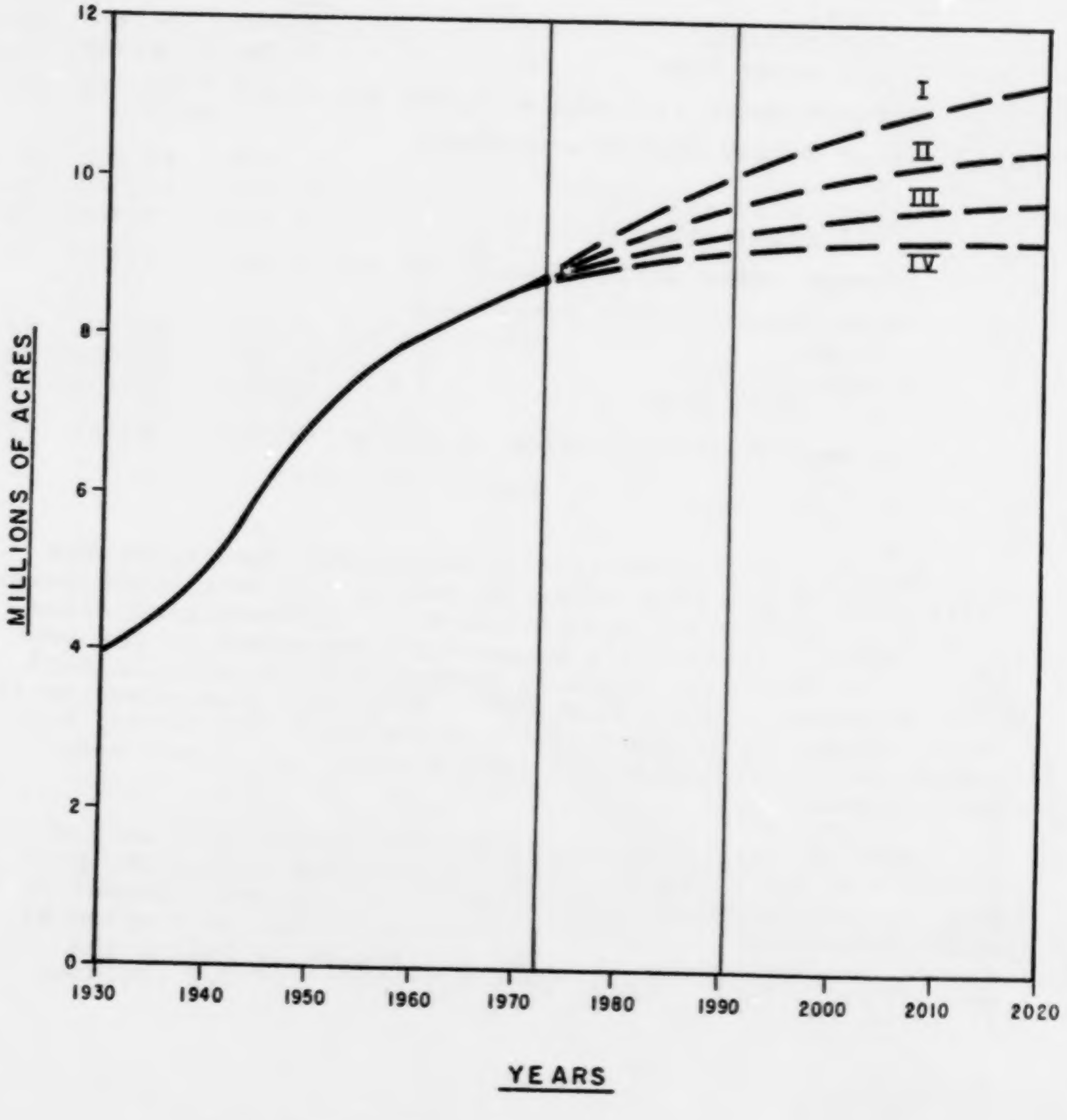
Recognition of Prime Farmlands Preservation as a State Policy. Because of the uncertainties mentioned above, the Legislature has taken actions directed toward preserving California'a prime farmland. Several bills have been introduced to create an Agricultural Resources Council at the state level to oversee the establishment of agriculture preserves. These bills would also require detailed mapping of existing prime lands and development of local land use plans aimed at protection and preservation of these lands (California Legislature, 1977a). However, no agricultural preservation bill has yet been enacted into law.

Prime Farmlands in Stanislaus County

Agriculture in the Stanislaus County Economy. With a combination of fertile alluvial soils, sufficient water supplies, long growing season and favorable climate, Stanislaus County ranks sixth among California counties in the value of agricultural production (Stanislaus County, 1977). As the most important local industry, agriculture directly or indirectly supports over 75 percent of the county's economic activity (Stanislaus Area Association of Governments [SAAG], 1972). Approximately 78 percent, or 754,400 acres, of the county's total area of 967,000 acres are currently in agricultural uses (Stanislaus County, 1977) including about 308,400 acres in cropland. About 300,000 acres in Stanislaus County are prime agricultural lands (SCS definition), including an urban land area of approximately 22,500 acres. A map of prime soils in eastern Stanislaus County is enclosed in the map pocket at the back of this report.

FIGURE 5-4

HISTORICAL CONDITIONS & PROJECTED IRRIGATED LAND AREA REQUIREMENTS IN CALIFORNIA



SOURCE: DWR, 1974

Table 5-5

EXISTING (1972) AND PROJECTED AGGREGATED WATER SUPPLY AND DEMAND AND ACREAGE UNDER IRRIGATION

	1972	1990	2020
Total Water Supplies	30,700	35,700	36,400
Alternative Futures:			
I. Water demand (1,000 acre-feet)			
total	37,400	46,200	55,300
agricultural	31,700	37,900	41,900
all other uses	5,700	8,300	13,400
Acreage under irrigation (1,000 ac)	8,780	10,200	11,360
II. Water demand (1,000 acre-feet)			
total	37,400	44,400	50,800
agricultural	31,700	36,400	39,000
all other uses	5,700	8,000	11,800
Acreage under irrigation (1,000 ac)	8,780	9,740	10,520
III. Water demand (1,000 acre-feet)			
total	37,400	42,400	47,000
agricultural	31,700	34,600	36,100
all other uses	5,700	7,800	10,900
Acreage under irrigation (1,000 ac)	8,780	9,380	9,850
IV. Water demand (1,000 acre-feet)			
total	37,400	41,100	42,900
agricultural	31,700	34,000	34,600
all other uses	5,700	7,100	8,300
Acreage under irrigation (1,000 ac)	8,780	9,180	9,360

Source: DWR, 1974

Agricultural production in Stanislaus County for the years 1968-76 has been characterized by the consistent leadership of livestock and poultry products in production value. Furthermore, California's comparative advantage in the production of specialty crops is particularly evident in data for the county: SAAG data (1976) show that Stanislaus is the state leader in the production of apricots, dry beans, boysenberries, honeydew melons, green peas, red clover seed and chickens.

Agricultural production requires inputs from many other industries and in turn provides inputs for transport, processing and marketing industries. The economic process by which agricultural production results in the generation of income and employment in other industries is called the multiplier effect. Based on a multiplier of 2.2 (Goldman and Strong, 1977)* the 1974 value of agricultural production of $500 million contributed a total $1.1 billion to Stanislaus County's economy.

Trends in Agricultural Land Conversion. Trends in agricultural land use become apparent upon examination of the changes in county land use over the past 20 years. Agricultural acreage declined from 882,446 acres in 1958 to 754,391 acres in 1977, a net decrease of 128,055 acres. This has been largely due to a change in status of rural lands from productive agricultural use as crop or rangeland to an idle or other unproductive status. At the same time, the county experienced an outward movement of orchards and vineyards. In many areas, orchards and vineyards have been planted on lands used formerly for field crops, pasture or range.

Some of the best agricultural lands in Stanislaus County are being irretrievably converted to urban and industrial uses. SAAG (1976) estimates that the Modesto-Ceres urban area occupied about 20,000 acres of mostly prime farmland (SCS definition) in 1976, having absorbed about 500 acres of prime farmland annually between 1950 and 1975. Although not all of the areas zoned for urban uses in 1975 had actually been converted to those uses, their inclusion within the boundaries of the urbanized area and the associated municipal obligation to provide them with urban services virtually assures their eventual conversion.

The expansion of Stanislaus County's urban areas has displaced high value fruit and nut acreage and has had a detrimental effect on the countywide yield levels for these crops. Although annual yields in the principal vegetable and field crop categories have increased significantly since 1960, yields in fruit and nut crops show a general decline during this period. In part, the decline may be attributable to the fact that fruit and nut yields from young orchards are significantly lower during their first few years, before the trees reach full maturity. However, declines in fruit and nut yields probably also reflect the fact that many of the new orchards are on nonprime soils, and therefore yields are likely to be permanently depressed, illustrating the price paid when best quality orchard and vineyard acreage is lost to urbanization.

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*SAAG, 1976 suggests a multiplier of 4. The Goldman and Strong data, gathered in 1974 but not published until 1977, show multipliers for agricultural commodities ranging from 1.5631 (milk production) to 2.3433 (onions); therefore, the use of the SAAG multiplier appears inappropriate. The multiplier of 2.2 used here is a weighted average combining the percentage distribution of local agricultural lands (row crop, field crop and pasture lands) by crop type (judgmental estimate by Armen V. Sarquis, County Director, U. S. Cooperative Extension).

Prime farmland depletion is exacerbated when leapfrogging or checker board urban development is allowed to take place. Under these conditions farm profitability is jeopardized both by increased taxes, as speculation raises land values, and by curtailment of agricultural practices such as fertilizer application and pest control to prevent the risk of hazards and nuisance to neighborhood residents. The cost of expanded city services to these developed areas (sewer, police, fire and educational facilities) may also have to be shared by the farmer. This scenario of urban growth and discontiguous development induces the farmer to intensify farm practices to increase revenues, to bear the cost of relocating, or to abandon farm operations altogether.

Future Prospects for Agriculture in Stanislaus County. Projections of future prime farmland urbanization in Stanislaus County have been made by the state, and 20,800 acres are estimated to be subject to conversion between 1974 and 1985 (OPR, 1974). City of Modesto urban growth is forecast in this EIS to require 6,440 acres by the year 2000, resulting in the conversion of approximately 5,320 acres of prime agricultural land. Urban growth elsewhere in Stanislaus would also result in agricultural land conversion.

There are about 24,800 acres in Stanislaus County with the potential for upgrading to prime (CLCA definition) through normal agricultural investment and management practice (OPR, 1974). The amount of potential prime land under the SCS definition has not been estimated but would be lower, because SCS definition is more restrictive. There are no idle existing prime farmlands, as defined by SCS, in Stanislaus County that could be used for replacement of lands lost to urbanization.

Recognition of Prime Farmlands Preservation as a County Issue. Stanislaus County has actively pursued a course of planning directed toward inhibiting the parcelization of rural lands and their absorption by leapfrogging urban development since the early 1970's. More recently, the County Planning Department has initiated background studies for an agriculture element of the Stanislaus County General Plan. The Stanislaus Area Association of Governments has prepared an agriculture data report (SAAG, 1976) as part of the Stanislaus Area Environmental Resources Management Element.

Summary and Conclusions

On the national, state and county levels, the continuing reduction in the available supply of prime farmland has aroused growing concern about future U. S. food and fiber production.

On the national level, an irreversible loss of approximately 1 million acres per year has been experienced in recent times. Should this trend continue, the ability of the nation's agriculture to meet growing demand - the world's population is expected to increase by over 50 percent to 6 billion by the year 2000 (United Nations, 1973) - may be in doubt. None of the future scenarios of the Worldwatch Institute presented earlier in this chapter anticipate a need for less than 410 million acres of total cropland (10 million acres more than the current base) to meet domestic and export needs in the year 2000.

With rising world demand for U. S. food products and increasing cropland losses, policy makers have become acutely aware of the nonrenewable nature of agricultural land. This awareness has produced a drive toward federal legislation, exemplified in the Agricultural Land Retention Act, to prevent the unnecessary and irreversible conversion of farmland to nonagricultural uses. Because of the considerable uncertainty over the future supply of productive cropland, future yields and future demand for agricultural products, there is a need to consider the costs and benefits of measures designed to preserve the prime agricultural land resources of the nation against continuing losses.

At the state level, prime farmlands of the highest quality are currently being lost at a rate of 25,000 to 55,000 acres per year. If this trend continues, up to 1.2 million acres of prime land could possibly be absorbed by urban and other types of development during the remainder of this century. The uncertainties associated with potential shortages in future water supplies and the high cost of converting currently nonprime lands to irrigated cropland make unlikely at present the prospect of compensating for this prime land loss by reclamation of available reserve lands (OPR: 8 million acres; SCS: 4 million acres; most reclaimable Class I and II lands are in desert areas or scattered through coastal valleys).

In Stanislaus County, there is a finite prime farmland base of about 277,500 acres (SCS definition). Urbanization of agricultural land in the Modesto-Ceres area has averaged about 500 acres annually over the last 20 years. No idle prime agricultural land (SCS definition) is available in the county to replace prime acreage.

Table 5-6 summarizes the present and potential supply of prime farmland in the county, state and nation.

Table 5-6

PRESENT AND POTENTIAL PRIME FARMLAND
COUNTY, STATE AND NATION

	Stanislaus County	California	United States
Total prime farmland (acres)	277,500	9,000,000	384,000,000[1]
Prime farmland in cropland use	277,500	9,000,000	250,000,000
Land with immediate potential for upgrading to prime cropland status	0[2]	undetermined[3]	15,000,000
Land with long-run potential for upgrading to cropland status	undetermined[4]	4,000,000	96,000,000[5]

[1] This value includes all prime land resources in the county regardless of their present use.

[2] There is currently no idle farmland in Stanislaus County which meets the SCS definition of prime.

[3] Upgrading of nonprime lands to prime status is contingent upon the construction of new water projects and irrigation water delivery systems, which may be feasible on a long-run basis but not on a short-run basis.

[4] Soils in groups 2-4 as identified in Appendix C could be reclaimed for orchards and vineyards but they lack the broader versatility of lands on the valley floor.

[5] Both prime and nonprime lands with potential for conversion to cropland are included in this category.

Source: Dideriksen, 1977; Singer and Reganold, 1978;
Houshang Esmaili Associates.

Whichever geographical area we consider, the overall picture is similar: the prime agricultural land base is finite and the portion currently in production is diminishing. While lesser lands are available which could be cultivated, impediments in terms of soil quality, water availability and access to public capital such as roads contribute to the cost associated with utilizing such lands. For these reasons, preservation of prime agricultural lands has been advanced as a public objective.

Future Conversion of Agricultural Land to Urban Use in the City of Modesto

The Effects of Federal Actions on Prime Land Resources

Modesto shares with many other American cities the prospect of continued community growth onto agricultural lands. Past growth already has absorbed nearly 20,000 acres of farmland represented graphically on the map of the area's urbanization trends in the pocket at the back of this report. By 1950, the Modesto area (including Ceres, Salida and Empire) occupied about 5,900 acres of what had been virtually all prime farmland. Another 4,200 acres were urbanized between 1950 and 1969, and an additional 7,800 acres by 1975.

Growth patterns, and the factors which encourage growth, are not all local in origin. Among federal actions in the past which have played a part in Modesto's growth are highway funding (rapid movement of goods up and down the Central Valley on State Route 99 having spurred food processors to serve western locations from Valley sites) and sewer funding. The Economic Development Administration, an agency of the U. S. Department of Commerce, provided 50% of the funding for planning and construction of Modesto's major sewer interceptor facilities in 1968-69. Federal government employment in the Modesto study area has increased dramatically in recent years, more than doubling between 1970 and 1975.

One of the purposes of this EIS was to determine the extent to which the specific federal action currently contemplated - the funding of Modesto's wastewater facilities expansion - would contribute to the community's continued growth onto agricultural lands, and what the impacts of agricultural land conversion would be. The conclusions were expected to provide guidance to EPA, Modesto and other potential grantee communities as to the types and scale of impacts to be expected from such EPA actions. The impacts disclosed by the analysis would, in turn, provide a yardstick against which the adequacy of mitigation measures could be evaluated.

Forecasting the Urbanization of Prime Farmland

The conversion of agricultural lands to urban uses is a function of three factors: the amount of growth, the density of growth and the spatial distribution of growth. Each of these factors is, in principle, predictable, although the availability of the kinds of data needed to undertake a prediction varies among communities.

Modesto together with Stanislaus County offers a recent history of strong local planning and of local data collection on land use patterns which greatly facilitated the analysis of urbanization trends. The city has had an urban growth policy since 1974; mandated annual reviews of this policy involve technical reports by city staff on growth trends, patterns and issues; City Council review and discussion; and an opportunity for participation and debate by the general public. The reports prepared in connection with these policy reviews provide a wealth of information on community development patterns. These reports are supplemented by comprehensive land use surveys (1971 and 1978) and by special studies conducted by city staff. But although Modesto's recent land development history is unusually well documented, most large cities (in excess of 25,000) in California's major agricultural areas appear to have basic land use and density statistics which would be applicable to comparable analyses.[1]

The methodology applied in the case of Modesto involved preparation of a full forecast of population and employment to the year 2000, these forecasts in turn serving as the basis for a forecast of land absorption by urban uses. The area delineated for forecasting purposes was larger than the City of Modesto - it had to be large enough to encompass all of the lands on which Modesto's current economic base is accommodated plus additional lands to be needed by residential and economic growth through the forecast period. Thus, the first output of the forecast (which is presented in detail in Appendices A and B of the Draft EIS) was a land use forecast for the Modesto socioeconomic study area. This forecast then served as the basis for the estimation of future land use change in the City of Modesto.[2] Table 5-7 presents estimates of future urban land absorption in the socioeconomic study area and the City of Modesto to the year 2000.

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[1] Gruen Gruen + Associates surveyed the 15 largest Central Valley and Delta Cities. Current basic density statistics can be calculated for all 15 given existing data; residential density for 12. Vacant land estimates can be calculated for 13 and vacant residential land for 11.

[2] While the overall forecast covered an area more extensive than the city, a city forecast was also needed both because the city is the focus of the project and because the City of Modesto is the agency directly responsible for both impacts and mitigation measures. The translation of impacts from the larger study area to the smaller city involved a number of interpretations and assumptions as discussed in Appendix A of the Draft EIS (pp. A-55 to A-56). Among factors affecting city (as distinguished from study area) growth, the most important is probably annexation decisions.

Table 5-7

FUTURE URBAN LAND ABSORPTION IN EIS SOCIOECONOMIC STUDY AREA AND IN CITY OF MODESTO 1979-2000

	Socio-economic Study Area		City of Modesto			
					At Project Capacity	
	1990	2000	1990	2000	Initial Construction Capacity (1984)	Planned Future Const. Cap. (1995)
Total Population[1]	171,720	202,670	129,100	162,300	112,750	145,000
New Population[2]	21,300	52,250	20,900	48,100	10,100	35,950
Added Dwelling Units[2]	14,710	28,090	9,530	22,060	3,360	15,530
Land Absorption (gross acres):						
Residential[3]	3,040	5,800	1,970	4,560	695	3,210
Commercial	180	440	180	410	90	305
Industrial	325	800	320	740	155	555
Park/Public	325	795	320	730	155	545
Total	3,870	7,835	2,790	6,440	1,095	4,615

[1] Limitations on the accuracy of city population forecasts are discussed in Appendix A of the Draft EIS, pp. A-55 and A-56. The same limitations apply to the land absorption forecasts.

[2] Between January 1, 1979 and project capacity year.

[3] Average residential density used in the forecast is 4.84 dwelling units per gross acre. This is slightly lower than the current density of 5.1 units per gross acre (6.8 units/net acre) reflecting (1) slowly rising real income and (2) the historical relationship between income levels and the mix of single- and multi-family units in the Modesto housing supply.

Source: Gruen Gruen + Associates

The EIS forecast is presented in Table 5-7 as a point estimate. That estimate lies within a range, the extremes of which vary with alternative employment assumptions.* The EIS forecast being somewhat lower than prior growth projections

*The lower end of the range represents the attainment of an unemployment rate of 6% by the year 2000 and a decline from 1.1 to 1.05 in the number of employed local residents per locally-employed local resident; the higher end represents a 10% unemployment rate and an increase in the ratio just described from 1.1 to 1.2. These assumptions are discussed in Appendix A of the Draft EIS, p. A-51.

prepared for Modesto and the county, an alternative (higher) future population figure* is provided for comparative purposes, permitting an evaluation of the implications of greater growth than the EIS analysis forecast. Both of the future growth estimates are translated into land absorption estimates (Table 5-7 represents the EIS forecast, but not the alternative) and these land absorption estimates are in turn translated into estimates of the conversion of prime agricultural land to urban use between 1979 and 2000 (the Draft EIS contained similar estimates for 1976-2000).

Table 5-8 presents three series of estimates of agricultural land conversion which reflect different magnitudes of growth and different densities of future residential development. Estimates are presented for the years in which initial and planned future construction project capacities are reached and for the year 2000. The latter are provided only for background and do not signify estimated impacts of the project.

Table 5-8

MODESTO URBAN LAND NEEDS AND AGRICULTURAL LAND CONVERSION ESTIMATES UNDER THE EIS FORECAST AND TWO ALTERNATIVE GROWTH SCENARIOS, 1979-2000

	Scenario 1 (Low population, high density)			EIS Forecast (Low population, low density)			Scenario 2 (High population, low density)		
	1984[1]	1995[2]	2000	1984[1]	1995[2]	2000	1983[1]	1992[2]	2000
Urban Land Needs									
Total Population	112,750	145,000	162,300	112,750	145,000	162,300	113,450	148,000	176,650
New Population	10,100	35,950	48,100	10,100	35,950	48,100	11,300	40,050	62,450
Added Dwelling Units	3,360	15,530	22,060	3,360	15,530	22,060	3,630	16,670	27,480
Residential Density[3]	7 du/gross acre			4.84 du/gross acre			4.84 du/gross acre		
Land Absorption (gross acres)	880	3,625	5,030	1,095	4,615	6,440	1,090	4,650	7,560
Agricultural Land Conversion									
Infill Development	880	3,625	4,000	1,095	4,000	4,000	1,090	4,000	4,000
On Ag Land (75%)	660	2,720	3,000	820	3,000	3,000	820	3,000	3,000
On Other Undeveloped Land (25%)	220	905	1,000	275	1,000	1,000	270	1,000	1,000
Other Development	0	0	1,030	0	615	2,440	0	650	3,560
On Ag Land (95%)			980		585	2,320		620	3,380
On Other Undeveloped Land (5%)			50		30	120		30	180
Total Agricultural Land Converted to Urban Use	660	2,720	3,980	820	3,585	5,320	820	3,620	6,380

[1] The year in which initial construction project capacity would be reached.
[2] The year in which planned future construction project capacity would be reached.
[3] The low density estimate is explained in note 2 to Table 5-7. The higher density would represent a movement by Modesto toward more dense residential development in the future, which is current city policy.

Source: Gruen Gruen + Associates

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*The basis of the alternative figure is an estimate by the California Department of Finance (DOF) of future Stanislaus County population given a 2.1 fertility rate and an annual net inmigration of 150,000 persons to California. This E-150 county projection was adapted to the socioeconomic study area and to the city by Gruen Gruen + Associates as described in Appendix A of the Draft EIS, pp. A-55 and A-56.

The urban land absorption estimates presented in Table 5-8 will not necessarily result in a one-for-one conversion of agricultural land. How much agricultural land will be converted will depend on the location of urban development: will it take place on prime agricultural land or on lands less valuable from an agricultural use perspective?

This question of spatial distribution is the third major determinant of agricultural land loss. In Modesto, the question is somewhat easier to answer than it might be in other communities. That is because nearly 100 percent of the land surrounding Modesto is categorized as prime agricultural land (see Figure 5-5).

However, land within the area that the city has committed to short-term development (the current sewer service area, or CSSA), unless it is still in active agricultural production, was not considered prime ag land in this analysis. Of the land the city has committed to long-term development (the ultimate sewer service area, or USSA), 95 percent was assumed to be prime agricultural land. The agricultural land conversion estimates in Table 5-8 therefore show urban development as taking place either at infill sites (within the CSSA) where 75 percent of the urban development would result in ag land conversion, or at other sites (in the USSA) where the proportion would be 95 percent.

Impacts of Prime Agricultural Land Conversion

There are a number of possible consequences of agricultural land conversion which would vary in importance depending upon the context. Changes may take place in local microclimate, in groundwater recharge, in runoff, in air quality and in a variety of other areas typically classed as "environmental". In the specific case of Modesto, however, the most important effects of agricultural land conversion were felt to be economic, fiscal and social, and each of these areas was considered in the analysis.

Economic Impacts of Agricultural Land Conversion.

The economic impact of agricultural land conversion is measured in terms of reduced incomes and jobs in the agriculture sector, and the indirect effect of those reductions on the rest of the local economy. The magnitude of impact depends on the number of current jobs and the amount of income associated with the acres predicted to be converted, which is a function principally of the type of agricultural use involved.

Table 5-9 presents a rough estimate of the effect of forecast agricultural land conversion on the local economy. This estimate is based on the average value per acre of crop production in the immediate Modesto area, which was about $965 in 1977.

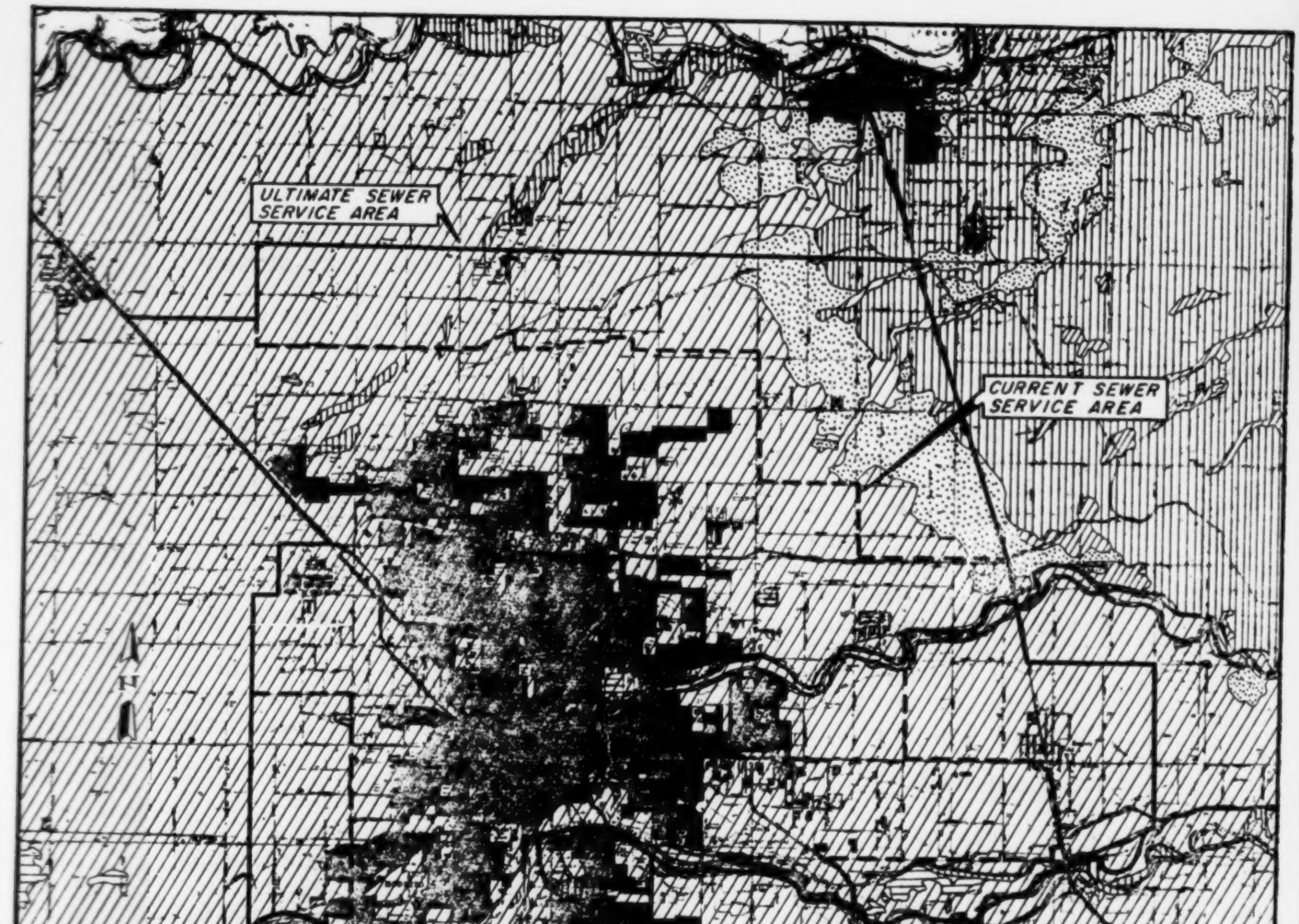
ULTIMATE SEWER SERVICE AREA
CURRENT SEWER SERVICE AREA
N
1/2
0
MILES
- LEGEND -
▨ PRIME, NO RESTRICTIONS
▤ RECLAIMED SALINE-ALKALI
▨ RECLAIMABLE SALINE-ALKALI
▨ RECLAIMABLE BY DEEP RIPPING
▥ NON-PRIME, RECLAMATION DIFFICULT

FIGURE 5-5
PRIME & NON-PRIME SOILS IN THE MODESTO AREA

Table 5-9

ESTIMATED ECONOMIC IMPACTS OF MODESTO AGRICULTURAL LAND CONVERSION: POINT ESTIMATES FOR YEAR OF CAPACITY USE AND 2000

(all estimates except acreage in thousands)

	Scenario 1 (Low population, high density)			EIS Forecast (Low population, low density)			Scenario 2 (High population, low density)		
	1984[1]	1995[2]	2000	1984[1]	1995[2]	2000	1983[1]	1992[2]	2000
Acreage Converted	660	2,720	3,980	820	3,585	5,320	820	3,620	6,380
Value of Displaced Crop Production ($965/acre[3])	$640	$2,620	$3,840	$790	$3,460	$5,130	$790	$3,490	$6,160
Indirect Income Loss (Multiplier = 2.2[4])	$770	$3,140	$4,610	$950	$4,150	$6,160	$950	$4,190	$7,390
Total Annual Income Loss	$1,410	$5,760	$8,450	$1,740	$7,610	$11,290	$1,740	$7,680	$13,550

[1] The point in time at which initial construction capacity would be reached.

[2] The point in time at which planned future construction project capacity would be reached.

[3] This estimate is a weighted average combining the percentage distribution of agricultural lands by crop type (judgmental estimate by Armen V. Sarquis, County Director, U. C. Cooperative Extension) and the average value of production per acre in each kind of agricultural use in 1977 (Stanislaus County, 1978): peaches, 25 percent ($1,700); grapes, 20 percent ($786); walnuts, 15 percent ($1,202); field crops, 15 percent ($321); almonds, 10 percent ($1,166); pasture, 10 percent ($95); rice, 5 percent ($540); overall average per acre, $965.

[4] University of California Cooperative Extension data collected in 1974 and published in 1977 show multipliers for agricultural commodities in Stanislaus County ranging from 1.5631 (milk production) to 2.3433 (onions). The multiplier of 2.2 used here is a weighted average combining multipliers for the commodities indicated in the preceding note. Indirect effects are calculated by multiplying 1.2 times direct effects.

Source: Gruen Gruen + Associates

Along with the income loss, the area would experience a reduction in agricultural employment. For the EIS study area as a whole, that reduction has been forecast as 1,000 jobs between 1975 and 2000 (2,800 agricultural jobs in 1975; 1,800 agricultural jobs in the year 2000). The higher density development scenario (Scenario 1) would help preserve these jobs; the reduction would be cut from about 1,000 to about 750. Scenario 2 would increase urbanization's toll on agricultural employment: upwards of 1,450 agricultural jobs might be lost. These job losses in the agricultural sector would induce job losses in other sectors as well as via the multiplier effect. In all, economic impacts of the conversion of agricultural land associated with the project could range from $8.4 million to $10.9 million per year by the time ultimate capacity of the planned future construction is absorbed (the EIS forecast is $11.2 million) and from $11.8 million to $17.8 million by the year 2000 ($15.5 million is the EIS forecast).

The job loss described would not show up in economic statistics as an overall decline in area employment. The conversion of agricultural land to urban use would have short-term economic impacts resulting from construction of the housing, commercial or industrial structures which would replace agriculture. It would also have long term impacts in terms of expanding the number of permanent positions in the growing sectors of the economy. However, whether specific individuals whose agricultural employment opportunities are reduced by agricultural land conversion will find suitable employment in other economic sectors is not known.

Conversion of the agricultural land closest to Modesto is unlikely to halt the area's economic expansion. Even the food processing industry, which is the major industry most closely linked to local agricultural production, is not strongly dependent on Stanislaus County crop and livestock production. While about two-thirds of the manufacturing employment in Stanislaus County is in the canned, cured and frozen foods and food processing industries (California Employment Development Department, 1976), these industries are not dependent on local agriculture alone. In fact, only about 10 percent of total payments and purchases of these industries in Stanislaus County went to agriculture within the county in 1974, while 39 percent went to purchases outside of the county and payments to governments outside the county (Lee, 1975). These relationships indicate that Stanislaus County is an element of a larger regional economy, so that the interdependence of local industry and local agriculture is not as great as might be supposed.

Pressures for urban growth throughout California's Central Valley may have begun to result in declining agricultural production such that in the long run (i.e., beyond the year 2000) food processing and other agriculture-related industries and services in the Modesto area may no longer thrive. Such a change would be analogous to the decline in agriculture-related industry in Los Angeles in the middle third of the twentieth century and the more recent decline of agriculture-related industry in the Santa Clara Valley. But, in neither Los Angeles nor San Jose has agriculture-related industry disappeared; the lag is very long. The analysis undertaken for this EIS does not forecast the demise of the food processing industry in Modesto during the 25-year period ending in 2000. If the preservation of a strong agricultural base and associated industries is to be accomplished in the long run, then reduction in the amount of agriculturally-productive lands must be minimized. However, this study has not identified a "threshold of no return" beyond which the long term viability of agriculture in the San Joaquin Valley is irretrievably lost.

Fiscal Impacts of Agricultural Land Conversion. Agricultural land is widely believed to be a fiscal asset to local government: it is thought to generate an excess of public revenues (primarily property taxes) over costs (public service requirements). This belief has frequently been supported by studies which compare the costs and revenues associated with a particular agricultural acreage to those resulting from residential development which takes place on that acreage. One such study in the Modesto area (University of California, Davis, 1973) found that agricultural land use was more "profitable" to local public agencies than the same acreage of residential and neighborhood commercial use.

The conclusions of such studies are generally limited to the specific parcels of land being studied; the off-site implications of agricultural vs. residential uses are often ignored. For example, in considering the fiscal impact of agriculture one should consider the costs of servicing the employees, owners and their dependents associated with agriculture and the land their residences occupy, less the revenues they contribute, in addition to the costs and revenues associated with the agricultural land itself.

The same principle holds when assessing the fiscal impact of residential land use. Residential development is generally associated with industrial and commercial (and agricultural) employment and land use; therefore, the costs and revenues associated with these activities should be included in the proper proportions along with the costs and costs and revenues directly associated with residential development. (The Goldman and Strong analysis cited previously includes some commercial land use associated with residential development, but not in proportion to actual urban nonresidential land use in the Modesto area.)

The development of an individual land use, whatever the use involved, does not take place in a vacuum. Just as new industrial development implies added housing elsewhere in a community for those who will be employed at the new plant, so the construction of residences in one part of an economic subregion implies that new industrial and commercial land uses are being developed elsewhere in the area.

In a specific local area - a rural school district, for example - urban development in the form of residences housing school-age children may well be a fiscal burden compared to the orchards they replace, when seen from the narrow local perspective. If the impact of new development were viewed regionally, what we would most likely see is that one public agency is getting the highly-concentrated costs of new development, while the benefits (sales tax revenues, for example) are going elsewhere. Each new development in a Modesto rural school district illuminates again the problems created when the costs and revenues of development are unequally distributed among jurisdictions. However, this problem is an artifact of local government finance; it does not "prove" that agriculture is always a more fiscally-beneficial use than housing. There is no standard answer to that question; each case would have to be considered for itself. The only generalization possible in this post-Proposition 13 period is that neither agriculture nor urban land use generates as much property tax revenue as it used to.

Social Impacts of Agricultural Land Conversion. One of the effects of agricultural land conversion in and around Modesto is the continued diminution in the number of small family farms. Average farm size in the San Joaquin Valley has risen steadily in recent years, and larger farms are generally agreed to be more efficient economically. Thus, as small farms are eliminated, they are unlikely to be replaced. Many of the impediments to the establishment of small farms have been identified in a recent California study (California Employment Development Department, 1977).

Loss of rural values and the rural lifestyle are accompanied, as cities like Modesto grow onto agricultural land, by changes in the character of the urban community. Opportunities to participate in civic affairs may be reduced as city size increases. There may be an increasing sense of impersonality, and even a decreasing confidence in personal security as a city grows. While growth may also bring new opportunities - cultural as well as economic - the changes may not be attractive to everyone. Many of these implications of growth were discussed in one of the Modesto Alternative Futures Symposia (January 16, 1978).

Mitigation of Agricultural Land Conversion

Introduction

The Modesto wastewater facilities expansion would accommodate the conversion of an estimated 2,720 to 3,620 acres of prime agricultural land to urban use if no additional measures are taken to mitigate such conversion. Mitigation of prime agricultural land conversion is the subject of the remainder of this chapter.

Adverse Impact on Prime Agricultural Land Requires Mitigation. Loss of prime agricultural land to urban uses is a frequently-observed indirect impact of public facilities investments in agricultural areas. It is EPA's intention to minimize the impact of its programs in reducing the amount of prime agricultural land. The policy of the agency is to protect, through the administration and implementation of its programs and regulations, the nation's environmentally-significant agricultural land from irreversible conversion to uses which result in its loss as an environmental or essential food production resource.

Urban Expansion in Agricultural Areas. For many reasons, cities have tended to be established in agricultural regions. As urban areas have grown, they have expanded onto lands formerly in agricultural production. Because Modesto is surrounded by agricultural land, the city's expansion would result in additional loss of prime agricultural lands to industrial, public, commercial and especially residential development. Other cities in agricultural areas may be less hemmed in by high-quality or unique agricultural lands, and may, correspondingly, have greater flexibility in directing growth so as to minimize agricultural land impacts.

No EPA Funding if Prime Agricultural Land Impacts Are Not Mitigated. EPA's funding of facilities providing Modesto with additional wastewater treatment capacity would allow growth to occur, and that growth would take place largely on prime agricultural land. EPA requires that no funding be awarded for projects which would enable "new habitations or other establishments" to be located on prime agricultural lands unless mitigated to the maximum extent possible.

Identifying and Implementing Mitigation Measures. To implement its prime agricultural land policy, EPA reviews municipal waste treatment grant applications to search for methods of mitigating the effects of agency-assisted activities on significant agricultural lands. EPA may propose types of local mitigation measures which could be taken, and the Draft EIS presented an inventory of possible measures for consideration.

The responsibility for selecting a mitigation program rests with the grantee. In this case, the City of Modesto proposed a package of mitigation measures to EPA (to be presented in the last section of this chapter) which the city believes represents the maximum effort currently feasible to respect prime agricultural land retention objectives while permitting the orderly growth of the community.

Local implementation measures, in Modesto or elsewhere, should be locally enforceable, with little or no ongoing participation by EPA. But local measures need to be supplemented by actions at the state and federal levels as well. It is important to recognize that agricultural land conservation is a regional and national problem; local agencies, even with the best intentions and the most sound planning approaches, cannot unilaterally effect farmland retention. State and federal agencies need to develop their awareness of the agricultural land conversion phenomenon and work, both separately and together, to develop positive strategies for dealing with it. Some nonlocal measures which might be taken on the state and federal levels are described in this section of the EIS.

Strategies for Mitigating Prime Agricultural Land Conversion. *Mitigation* is the alleviation of a condition which has exceeded a threshold of tolerability.

Determining Whether Prime Agricultural Land Loss is a Mitigatable Impact. The threshold of tolerability of adverse impacts may be established at different levels by different observers. In the case of the air pollutant sulfur dioxide, for example, the federal government and the State of California have established different standards. Those standards effectively represent thresholds at which the two governments respectively consider that the impact of air pollution has become so adverse (severe) as to necessitate reduction (mitigation). The amount of sulfur dioxide in an air basin could potentially be reduced enough to comply with federal standards - thereby achieving 100% mitigation - while eliminating only part of the pollution required to comply with state standards.

Some impacts may, either by their nature or with reference to a standard, be non-mitigatable. The elimination of a wildlife species, for example, is a non-mitigatable impact: it cannot be reduced, ameliorated or neutralized except by preventing the impact. Or, to look again at air pollution from sulfur dioxide, if the clean air standard were set such that the pollutant-free quality of a particular basin must be maintained, then the discharge of any sulfur dioxide into that basin would constitute a non-mitigatable adverse impact.

The documented loss of prime agricultural land and the irreversibility of that loss has stimulated the federal government to require mitigation of future losses where federal funds are involved. Neither EPA nor the Department of Agriculture (USDA) has at present determined that agricultural land conversion is a non-mitigatable impact (although in a crisis situation both government and popular thinking would probably support that view). Instead, the federal government's current approach is to acknowledge that there are alternative ways of completing a project and that those alternatives may have different effects on the environment.

With regard to the direct impacts of a wastewater treatment facility, a key question might be whether the site chosen is on prime agricultural land or would adversely affect agricultural operations on nearby lands. With regard to indirect impacts, a key question would be whether the grantee municipality can demonstrate that it is taking all possible measures to reduce the conversion of agricultural land resulting from the growth accommodated by a wastewater treatment facility expansion.

Concepts of Mitigating Agricultural Land Conversion. Mitigation measures responding to agricultural land conversion may be classified according to two major criteria:

Directing Urban Development vs. Enhancing Agriculture's Survival Potential. The latter type of measure would make agricultural uses economically more competitive with urban ones, thereby assisting farmland owners in resisting pressures for conversion. The former type of measure would reduce the ability of urban uses to demand conversion/absorption of prime agricultural land.

Regulations vs. Incentives. Regulations either direct that an action occur or prohibit it from occurring, subject to penalties. Incentives, in contrast, offer rewards for specified types of behavior or actions, but do not impose penalties for noncompliance. The reservation of a resource for the encouraged use is one kind of incentive.

In general, mitigation measures are either urban- or agriculture-oriented and are either regulations or incentives. Most of the measures inventoried in this chapter are directed toward guiding urban expansion; those designed to enhance agriculture's resistance to conversion constitute about one-fourth of measures discussed. About half of the measures presented are regulatory in approach, while the other half are incentives. The matrix of mitigation measures (Table 5-10, p. 172) classifies all the measures discussed according to approach.

Purpose of the Mitigation Measures Inventory. The mitigation measures inventory presented in this EIS is intended to be a comprehensive compilation of approaches to agricultural land retention at all levels of government. An extensive literature review and interviews with agricultural land experts in government, research and the private sector supplied most of the measures on the list; additional measures were suggested by the EIS consulting team and EPA staff.

Inventory is Exhaustive. An effort was made to include in the inventory all the classes of mitigation measures known to exist or to have been proposed, regardless of their political feasibility, likely effectiveness or cost.

Inventory is Evaluative. Each type of measure is discussed in terms of its likely effectiveness in addressing agricultural land retention objectives. Ideally, such a discussion would be able to draw upon sound research into the effects of specific measures in the contexts in which they have been implemented, providing longitudinal and/or cross-sectional comparisons leading to valid conclusions concerning the degree to which agricultural land retention is attributable specifically to a given regulation, policy or other measure. Unfortunately, research of this kind on farmland preservation has been practically nonexistent; even programs for which the most vigorous claims of success have been asserted generally have not been subjected to a thoroughgoing impact analysis. For this reason, the effectiveness evaluations presented here are based primarily on the analytical perspective of land economics rather than on field research.

Measures Discussed Vary in Net Effectiveness. The direct effect of a mitigation measure may be to preserve land in agricultural use in a given area. However, that benefit may be offset if the regulation or policy which produces it also results in a displacement of development pressures to other locations. Presumably, the governing objective is total agricultural land retention. If it were found that the effect of Modesto's mitigation measures was to shift development to other prime agricultural lands in Stanislaus County, the net effectiveness of such measures would be doubtful. Where such a shift - locally described as "spillover" - transfers development from a more restrictive (e.g., higher density requirements) to a less restrictive development environment, the outcome may well be less desirable than what would have resulted if the measure causing the shift had not been implemented. In general, the more extreme a unilateral municipal measure, the more likely that spillover development will result. Those mitigation measures which appear strongest may have a poor net effectiveness if implemented in only one city; their effectiveness would be greatly increased if implemented on a regional basis.

Inventory Does Not Consider Economic Costs. Mitigation of prime agricultural land conversion is not a cost-free policy. Incentive measures may be readily seen to have costs associated with them; for example, if the farmland owner pays lower taxes, other taxpayers will have to pay more. Regulatory measures also have cost effects. For example, if a city limits the supply of buildable land by zoning most undeveloped land for agriculture, the price of remaining land will rise sharply and be reflected in higher housing prices. In general, the costs involved are direct monetary costs: higher taxes and higher prices for housing and other land-related goods.

It has been pointed out that the effectiveness of many of the measures inventoried has not been adequately field-tested. The same observation can be made about the costs of agricultural land retention measures: the magnitude and incidence of costs imposed and benefits conferred have rarely been estimated. The preparation of a full cost/benefit analysis of agricultural land retention and of alternative implementation measures is one of the recommendations of this EIS. Such an analysis would be a helpful guide to decisionmaking relating to farmland at all levels of government.

The inventory does not address the question of economic costs. The reader should keep in mind the fact that agricultural land retention would impose costs, and the benefits of any given measure would have to be evaluated in relationship to the specific costs associated with it.

Organization of the Inventory. Mitigation measures have been grouped into eight major categories. Each of the groups of measures is presented in the same format: the rationale of the whole class of measures is first described, and then each individual measure is discussed separately.

Each discussion is organized under four headings: *theory*, which describes the basis for proposing a given approach; *implementing agency*, which may be local, state or federal government or some combination; *application*, which describes the specific means of implementation; and *effectiveness*, which discusses how and the extent to which the measure would affect the net amount of farmland retained. Table 5-10 (p. 172) provides a summary and indicates the page numbers on which each of the measures is discussed. The mitigation measures are numbered within each major category to facilitate reference to them.

Mitigation Measures Inventory

Each subsection below addresses a family of mitigation measures; lettered headings indicate the major thrust of the measures in that family.

A. Affect the Amount of Urban Development

Rationale. Development of prime agricultural lands into urban uses is a major cause of diminution of the prime agricultural land resource. Limiting the amount of urban development permitted would limit agricultural land losses.

Measures to Limit the Amount of Urban Development.

1. Limit the Amount of Land Zoned for Urban Development.

Theory

Land becomes a potential location for urban development when it receives an entitlement for urban use from the county or city in which it is located. That entitlement - the authorization to be developed into a specified use - is generally contained in the zoning ordinance, and the zoning category to which the land is assigned identifies the types of uses which may be developed on it. Land not zoned for urban uses must obtain such zoning prior to development.

Implementing Agency

Local general purpose government.

Application

Limit the amount of land classified in zoning categories which permit urban uses (such as residential, commercial, industrial). Assign the remaining land to zoning categories which permit only agricultural or open space uses.

Effectiveness

Many observers of rural land use change believe that rural residential development is one of the greatest threats to agricultural land resources. Zoning provisions limiting urban uses to urban areas can be very effective in addressing this problem. In Stanislaus County, the county's commitment to maintaining exclusive agricultural zoning on unincorporated lands has virtually halted rural subdivision activity. Developers wishing to subdivide rural land near Modesto must annex to Modesto and comply with the city's development regulations, which limit available locations for urban uses.

It is possible that strict observance of agricultural zoning in one jurisdiction will displace rural residential development to less strict neighboring jurisdictions. To avoid this kind of spillover, adjacent counties should coordinate their rural residential development policies. Counties can also make provisions for rural residential development in non-agricultural areas.

From the cities' perspective, it is important that urban zoning allow sufficient land for development to prevent significant displacement to nearby communities or to rural areas. Urban zoning which falls short of the effective demand for land for urban development will cause displacement, which would be counter-productive if the displaced uses are located on prime agricultural lands in other areas.

2. Limit the Number of Building Permits Issued.

Theory

More than the proper zoning is required to entitle urban development. The jurisdiction in which the land is located has the power to issue a building permit, which allows construction on the property in question (and without which no construction is allowed).

Implementing Agency

Local general purpose government.

Application

Issue only a limited number of building permits per year. To limit the amount of development, the number of permits issued would have to be lower than the number requested. Permits need not be issued on a first-come, first-served basis; rather, the city could review all development proposed within a specified time period according to a given set of criteria and award permits to those which best satisfy the criteria.

Effectiveness

This measure operates by controlling directly the amount of development. Its direct effects in retaining agricultural land can be very strong, depending on the location and size of sites for which building permits are issued.

Many cities have implemented this approach in order to limit the pace of population growth. Petaluma, California was one of the first cities to implement a plan for limiting the number of building permits issued each year. The so-called Petaluma Plan limits the number of new dwellings in developments of more than four units to 500 per year. The permits are not issued on a first-come, first-served basis; rather, the proposed developments are reviewed by the city for design and other quality-related criteria, and the developments gaining the most points are awarded the permits. The discretionary authority of the city to select the development plans with greatest merit could be used to encourage developments which least interfere with agricultural land use.

Building permit limitations are effective in encouraging the quality or characteristics of development desired in proportion to the degree that development demand exceeds the permit quota. To the same degree, however, they also encourage spillover by shifting development pressures to less restrictive locations.

3. Limit Industrial Growth Generators.

Theory

The major generator of urban growth is expansion of the employment base. Those who come to fill new jobs seek housing and other urban uses near their jobs. If industrial growth were limited, then other urban growth would be abated.

Implementing Agency

Local general purpose government.

Application

For areas with zoning, reassign land currently zoned for industrial use to other land use categories, thereby limiting potential sites for new industries. Other approaches include:

(a) restructuring the schedule of business license fees - e.g., charge according to the number of employees - to penalize industries which employ many workers or

(b) use city payroll taxes to discourage industries with many employees from choosing local sites.

Effectiveness

Discouraging employment growth as a means of inhibiting urban population growth is an indirect approach to reducing the amount of prime agricultural land ultimately converted. Effectiveness therefore depends on a chain of events; farmland retention would not be achieved if new industrial development continued on currently-underutilized parcels or if business and payroll taxes were not high enough to neutralize the other advantages of a local site; if industries located on nearby, unrestricted sites and their employees chose to live in local residences; or if the fewer resulting local employees, finding less competition and consequent lower prices for homesites, occupied more land per household than they would have in the absence of deterrents to local growth.

B. Affect the Density of Development

Rationale. The amount of land absorbed by urban development depends not only on the amount of growth to be accomplished but also on the density of the development. If the density at which urban development takes place were increased, the amount of agricultural land lost would be reduced.

There are three major density situations affecting farmland, two urban and one rural. One kind of low-density urban development pattern is continuous large lots: because each lot occupies so much space, few lots can fit in a given area. The compensation for this type of low density development is to allow or mandate higher densities.

A second kind of low density urban development occurs where smaller-sized or average-sized lots are scattered through a large area. The existing development extends over much land without actually occupying some of it; the unoccupied portions, however, may become unfit for agricultural use because they are surrounded by urban uses. The remedy for this type of low density development is infilling the vacant parcels.

Finally, rural areas often are subject to inefficient residential development patterns. The remedy for that situation is a change in approach to regulating the location and density of rural development.

Measures to Affect the Density of Development.

1. Low Minimum Lot Sizes in Urban Areas.

Theory

Zoning controls not only the use which may be established on a given parcel of land but also the physical characteristics of that use. Among the physical characteristics commonly governed by zoning are size of lot; height, bulk and placement of buildings; and number of parking spaces. These characteristics can be regulated in ways that will increase urban densities.

Implementing Agency

Local general purpose government.

Application

Reduce the minimum lot size allowed in residential zones.

Effectiveness

Reduction of lot sizes allows developers to fit more dwelling units in a given amount of area or, conversely, to accommodate a given number of dwelling units in a smaller area. Because smaller lots are only allowed and not mandated, however, effectiveness depends on the public's willingness to accept smaller lots.

2. High Minimum Lot Sizes in Rural Areas.

Theory

Just as harmful to agricultural uses of prime lands as their replacement by urban uses is the parcelization of rural lands. Parcelization - the division of larger rural parcels into plots which are too small to be farmed economically - is encouraged when large-lot rural homesites are feasible alternatives to in-town residential sites. Scattered rural residential development may absorb or render unsuitable for agriculture more land per housing unit than concentrated urban development.

Implementing Agency

Local general purpose government with jurisdiction over rural lands.

Application

Establish minimum lot sizes in rural areas which are too large to be affordable for single-family homes.

Effectiveness

Where minimum lot sizes are large enough, they will make the price of a single-family house and lot significantly higher than that asked for the most desirable homes in the existing urban area, which will discourage rural parcelization for residential use. For maximum effectiveness, large minimum lots must be required in all prime land areas near enough to the employment base for feasible commuting.

3. Maximum Lot Sizes in Urban Areas.

Theory

Zoning regulations typically specify minimum lot sizes but rarely establish maximum lot sizes. Establishment of a maximum lot size would help prevent very low density development.

Implementing Agency

Local general purpose government.

Application

Specify in the zoning ordinance maximum allowable lot sizes in urban areas in addition to minimum sizes, setting the maximum at a level which will allow for size variations demanded by market forces as well as those necessitated by subdivision design features such as cul-de-sacs, curves and corner lots.

Effectiveness

By establishing and enforcing a maximum land area for individual lots smaller than what would otherwise be built, the zoning ordinance would limit the amount of land which could be occupied by any individual residence and thus will increase overall urban density. Consumers seeking large lots may, however, purchase ranchettes or 10-acre parcels in rural areas in outlying jurisdictions or larger lots - potentially on prime land - in neighboring urban areas; these spillover effects would reduce the effectiveness of this measure.

4. Minimum Neighborhood Densities in Urban Areas.

Theory

Increases in urban residential densities can be achieved not only on a lot-by-lot basis but also on a larger area - for instance, a neighborhood - basis. The latter approach would allow for variation in individual housing arrangements while still achieving an overall increase in density.

Implementing Agency

Local general purpose government.

Application

Use the zoning ordinance, the general plan or neighborhood prototype plans to specify minimum densities for each neighborhood. Allow the minimums to be achieved through a combination of lot sizes and single-family/multiple-family configurations. The zoning districts should be defined as density districts, so that the owner of a double lot developed for a single unit permanently retains the right to develop a second unit on the site. The same principle applies to higher-density districts which may initially be developed at lower-than-permitted densities.

Effectiveness

Neighborhoods would be composed of a number of residential developments, and homogeneity of housing type could be maintained within individual developments if desired, while varying among developments within a given neighborhood to both meet density objectives and offer sufficient variety in the housing stock to satisfy differing consumer needs and preferences. A minimum neighborhood density helps assure that overall city density objectives will be considered as each residential development project comes up for approval. This approach is most effective for newly-developing areas rather than existing neighborhoods, where infill strategies are more suitable.

5. *Infill Development in Urban Areas*.

Theory

Discontinuous small lot development leaves vacant land amid the pockets of development. It may be remedied by directing new development to available vacant or underutilized sites in already-developed areas.

Implementing Agency

Local general purpose government.

Application

Identify potential sites for infill development, and encourage infill through:

(a) restrictions, such as refusing to zone additional other lands for urban use or refusing to provide urban services (such as sewers, water, police and fire protection) to new areas; or

(b) incentives, such as allowing high densities or waiving development fees.

Effectiveness

Parcels in an urban area which remain vacant while the land around them develops often have been bypassed for a reason, which may be physical (topography, soil conditions, water table level, flood plain), social (ownership dispute or encumbrance, "hobby" use) or institutional (zoned use is infeasible at that location). Whatever the obstacle to development, it is not removed by limitations on development at other sites.

If infill development is promoted via restrictions on other building sites and previous obstacles to development are overcome, housing costs (prices and rents) in the infill area are likely to be significantly higher than prices have been when development sites were unlimited. The reason for the increase is that owners of infill sites will have been awarded a monopoly position: because they hold the only potential development sites, they will charge whatever they think the market will bear for the use of those sites. Their incentive to sell or develop in the short term may be reduced, because the longer they hold the sites the more they hope to be able to charge for them. This dynamic may provide an incentive for developers to seek sites in other communities, outside the residential area, thus counteracting the benefits of infill. An incentive approach is likely to be more effective because it is less likely to cause spillover.

6. Cluster Development in Urban Areas.

Theory

The conventional style of single-family residential development, which produces one detached house on each lot and allots each house its private yard, uses more land per unit than does clustered housing. In the latter, side yards are eliminated and private yards are reduced and replaced by community open space.

Implementing Agency

Local general purpose government.

Application

Amend the zoning ordinance to allow clustered arrangements of single-family dwelling units. Such an amendment would have to eliminate the types of lot size requirements designed for detached single-family development and substitute requirements which allow common walls or smaller side yards and shared recreation/outdoor relaxation areas and facilities.

Clustered housing is often allowed in Planned Development (PD) or Planned Unit Development (PUD) zones, some of which also provide for planning agency review of site plans and architectural designs to assure that development will be visually satisfying and will assure privacy to each unit.

Effectiveness

Cluster housing developments are generally subject to much closer scrutiny by local planning agencies than are traditional single-family detached projects. Cluster developments have generally appealed primarily to specific market segments (usually singles or couples without children). Whether cluster developments built with less city review would also be acceptable and whether cluster developments in general will satisfy the needs of families with children is not known. The effectiveness of clustered urban development patterns in preserving farmland is strictly a function of its higher density.

7. Cluster Development in Rural Areas.

Theory

Development that occurs in rural areas, when a farm owner sells part of the farm, can disrupt the agricultural use of the land sold. In areas where the minimum lot size is 10 acres, for example, the owner of 40 acres wishing to build two houses or sell two homesites must divide the 40 acres into three parcels: one 20-acre parcel and two 10-acre parcels. If it were possible to cluster the desired development, the disruption of the farm use would be much reduced.

Implementing Agency

Local general purpose government with jurisdiction over rural land.

Application

Adopt a zoning provision for agricultural areas which provides that residential development on prime land be clustered on smaller parcels than permitted under conventional rural zoning. For example, the aforementioned farmer could divide his property into two one-acre lots (for two houses) and one 38-acre parcel (the remainder); such an arrangement would leave most of the original ownership and use intact.

Effectiveness

The major problem with land divisions is that when the smaller parcels are transferred to different owners the likelihood that the original agricultural use will be continued is reduced. Cluster development allows for the maintenance of larger, single-ownership parcels which are more amenable to continued agricultural use, even when sold.

Rural cluster development must be closely regulated, however, to assure that more lots than were originally allowed are not split off from the original major parcel. In the example above, this regulation would be used to make sure that no more than three one-acre parcels were split off from the 40-acre parcel.

C. Affect the Location of Urban Development

Rationale. The goal of this series of mitigation measures is to protect prime agricultural lands by considering the suitability of land for agricultural purposes as the principal criterion in determining where urban development will be permitted. The two focuses of affecting development location - (1) restricting new locations on prime land for urban development and strictly limiting urban development on prime land and (2) protecting existing agricultural uses on prime land - will be discussed separately.

Measures to Control the Location of Urban Development.

1. Growth On or Toward Non-prime Lands.

Theory

To minimize or eliminate the absorption of prime lands by urban uses, locations which are not on prime land should be identified and development should be directed to those locations. If there are no non-prime soils adjoining the urban area but there are some in the vicinity, development should be allowed on the lands most directly between the urbanized area and the closest non-prime land.

Implementing Agency

Local general purpose government.

Application

As new lands are required for urban development, grant entitlement (the right to develop) to those lands which are either (1) non-prime or (2) most directly between the existing urban area and the nearest substantial area of non-prime soil.

The City of Visalia, California and Tulare County, California (in which Visalia is located) have both adopted programs which encourage growth on or toward non-prime lands by applying ranking systems for agricultural/potential agricultural lands. These systems effectively broaden the defining criteria for prime land to include factors other than soil characteristics and then direct growth toward the newly-defined non-prime lands.

For example, under the Tulare County Rural Valley Lands Plan, points are awarded to designated parcels based on soil capability (as defined by USDA); size; current or potential agricultural use; if currently in agricultural use, the sizes of surrounding parcels; uses of adjacent parcels; nearby uses which are considered incompatible with urban uses; level of the groundwater table; proximate agricultural preserves; distance from the nearest fire station; access to a paved road; historical, archaeological or unique characteristics; location in a flood plain; and availability of water. The categories are weighted to yield a maximum assignment of 30 points. Parcels assigned 17 or more points are automatically retained in agriculture and those assigned 11 or less are considered for nonagricultural uses; parcels awarded 12 to 16 points are evaluated further based on additional criteria. Thus, the Tulare system extends the definition of non-prime to consider the availability of urban infrastructure, the use of adjacent lands and the existence of unique or culturally-valued features in addition to the characteristics of the soil.

The Visalia system is similar to but not as complex as that adopted by Tulare County. Lands are assigned to one of four categories depending on their USDA soil classifications and availability of water for irrigation. One class of lands is assumed to have no current or immediate potential for agriculture; the other three are assumed to have agricultural use or potential, but exclusions from them may be made based on examination of water supply and ownership.

Effectiveness

Because this measure involves the designation of specific lands on which development may occur, the potential of monopoly pricing for developable land is a possibility. To the extent that landowners, recognizing the lack of competition in land sales, raise their prices, they may prompt developers to seek other sites in nearby but less-regulated jurisdictions. If a community has no non-prime lands nearby, this measure would nearly eliminate growth. Displacement effects (spillover) might result.

2. Prohibition of Subdivisions on Unincorporated Lands.

Theory

Most of the land surrounding many communities located in agricultural areas is prime agricultural land. One way to limit the prime land locations available to new urban development is to prohibit subdivisions in unincorporated areas and limit lot splits.

Implementing Agency

Local general purpose government with jurisdiction over rural land.

Application

Prohibit subdivisions in rural areas and prohibit division of existing parcels.

Effectiveness

The price of large-sized parcels currently used for agriculture is likely to deter households from purchasing them for exclusively residential use; consequently, this measure greatly reduces the possibility of additional urban-oriented residential development in rural areas. It may be circumvented, however, if there are rural areas within commuting distance of the local employment base which do not have similar restrictions. The measure would be most effective if implemented on a regional (multi-county) basis.

3. Local Eligibility for Federal and State Housing Programs.

Theory

It is the existence of federal and state housing programs such as Federal Housing Administration (FHA) mortgage insurance, Veterans' Administration (VA) and California Veterans' Administration (Cal-Vet) mortgage guarantees, Farmers' Home Administration (FmHA) guarantees and subsidies and government-related mortgage purchase (secondary market) operations which have made homeownership a reality for most households who own single family homes. Without those programs, the purchase of a house would be beyond the reach of most families. If those programs were eliminated or their use restricted, effective demand would decrease. The decrease in effective demand would, in turn, slow down the amount of residential construction. Therefore, if these programs were unavailable to purchasers of new homes built on prime agricultural lands, builders would be much less likely to select prime land sites for housing development.

Implementing Agency

Federal and state governments (various program-administering agencies).

Application

Make homes built on prime agricultural lands ineligible for participation in federal programs - such as those administered by FHA, VA and FmHA - or their state-sponsored equivalents, or in secondary mortgage market operations (FNMA, GNMA, FHLMC).

Effectiveness

The indirect penalties imposed by this measure depend for effectiveness on the continued reliance of housing consumers on the types of programs named above. To the extent that private mortgage insurance opportunities displace FHA or that down payments are large enough (20%) to obviate the necessity of mortgage insurance, it will not discourage the location of homes on prime land. A prohibition on secondary mortgage market participation would likely be a stronger deterrent, as lending institutions rely on those operations to maintain their supplies of loanable funds and keep their lending costs down.

4. Eligibility for Community Development/Redevelopment Aid and Intergovernmental Assistance.

Theory

Cities depend on assistance from the state and federal governments for a large portion of community development and redevelopment funds. These funds are used to build or recondition urban uses, including especially residential and commercial development. If those funds were awarded on the condition that they not be used for any projects located on prime agricultural lands, that condition would serve to eliminate those lands as potential locations for publicly-funded development.

Implementing Agency

Federal and state governments (grant-awarding agencies).

Application

Establish as a condition of federal grant awards that no projects funded with those grants be located on prime agricultural lands.

Effectiveness

This measure would be effective in eliminating new federally-assisted or state-assisted development on prime agricultural land. However, such projects probably constitute only a very small portion of total development.

5. New Towns or Satellite Towns.

Theory

If the majority of the land around one or more existing communities is prime, new development should take the form of a completely new community on nearby non-prime lands. This completely new community would accommodate all new development - industrial, commercial and residential - which would have occurred in and around the existing city in the absence of efforts to protect prime agricultural lands.

Implementing Agency

State or federal government.

Application

The non-local agency would allocate funds to build urban infrastructure capable of attracting and supporting all types of urban development (residential, commercial, industrial and public facilities) in locations on non-prime lands. A public information program to alert households and firms of the development of the new town and locational incentives may be necessary to attract development.

Effectiveness

A new town must attract a balanced mix of urban uses if it is to be a true urban community rather than another bedroom suburb whose residents commute long distances to existing employment centers (thereby contributing to such other environmental problems as air pollution and excessive energy consumption). Industrial locations with access to road and rail transportation reasonably close to major existing trade routes as well as an ample labor supply are essential in drawing industries to the new town. Success of this measure depends, therefore, on the willingness of employers and households to locate in the new town and the ability of the new town, once established, to limit its urban spread to non-prime lands. New towns are very expensive to develop, and success has been limited.

6. Urban Strategy.

Theory

California's Office of Planning and Research (OPR) has developed an Urban Strategy which contains three major policies for state policy relating to urban areas: (1) the maintenance of existing urban areas; (2) infill of vacant urban land; and (3) urban growth onto contiguous land when expansion is necessary. The implementation of the urban strategy would thus focus new urban development in existing urban locations and minimize its spread onto prime agricultural lands. The Urban Strategy also advocates non-contiguous urban growth if all contiguous lands are prime farmland.

Implementing Agency

State government: legislature, governor and departments responsible for administering various programs.

Application

Implementation of the Urban Strategy must be accomplished through the adoption of legislation which would put its policies into effect. Such legislation might include requiring cities asking for state financial aid to meet the standards indicated above by requiring them to adopt five-year capital improvements programs (CIP's) and requiring review of the CIP's by local planning departments; requiring CIP's for all service districts providing growth-inducing services; requiring Local Agency Formation Commissions' (LAFCO's) regulatory actions to be consistent with their designated spheres of influence; requiring cities and counties to designate urban service areas; and requiring the assessment of regional needs for major metropolitan areas in the state. It would also require that the state's own public works projects conform to the Urban Strategy.

Effectiveness

The legislative requirements outlined above would limit the urbanization of prime lands only if they were designed with that specific purpose in mind. It may be observed that some communities already have local policies and development regulations consistent with the three key urban policies, but that their location within a prime land area nevertheless results in the conversion of prime agricultural lands if and when they grow.

Measures for Maintaining Existing Agricultural Locations. Potential measures for maintaining agricultural land at existing locations all involve regulation of those locations. The types of regulations fall into two groups: regulation without compensation and regulation with compensation. Both types are discussed below.

7. General Plans

Theory

In addition to zoning ordinances, many parts of the country allow or mandate the adoption of general, or comprehensive, plans to govern land use. General plans are less specific than zoning ordinances, setting guidelines for land use patterns, transportation/circulation routes and other aspects of the urban environment. The distinction between general plans and zoning may best be explained by an example: the land use element of the general plan may designate that an area be devoted to commercial uses; the zoning ordinance would specify which specific types of commercial uses (dry cleaning store, shopping center, automobile dealership, office building) and what minimum lot size, building setback requirements, height limit, parking and loading provisions and other physical characteristics will be permitted. In many ways, zoning is considered a means of implementing the general plan.

General plans may (and in some cases must) be organized into elements, each of which addresses a different topic. Elements dealing with agriculture, open space and conservation or natural resources (or some combination of these) could be developed to govern the use of prime agricultural land resources.

Implementing Agency

Local general purpose government with jurisdiction over agricultural land.

Application

Adopt an agriculture, open space, conservation or natural resources element of the general plan. Included in the element would be identification of prime and other valuable agricultural lands and establishment of goals and policies to control their use. These goals and policies would be directed toward protecting and preserving the identified lands. Lands could not be removed from the protection of the element except by the general plan amendment process.

Effectiveness

California law now requires that zoning be consistent with the general plan. This requirement gives the general plan more power to direct everyday land use decisions, and means that changes in allowable land use must be reviewed twice - for a general plan amendment and then for a zone change - before they can be implemented.

The consistency requirement strengthens the effectiveness of the general plan. Historically, such plans have often been shelved and urban or rural development allowed to proceed without regard to their standards. However, the most ambitious general plan can be no stronger than the local commitment to its goals and policies.

8. Federal Review of General Plan Elements.

Theory

A local general plan is highly susceptible to local political pressure. Because of this susceptibility it is not clear whether an element of the local general plan setting forth agricultural land policy would be effective in maintaining the existing agricultural locations. Farmers who wanted to sell and developers who wanted to buy could organize an effective pressure system to get the general plan changed. Review of proposed changes by other government agencies, however, could serve to discourage non-essential general plan amendments.

Implementing Agency

EPA, USDA or other interested federal agency. Contingent on local adoption of a general plan element addressing agricultural land retention.

Application

Any proposed change in a general plan element which controls use of agricultural lands would be subject to review by EPA and/or the U. S. Department of Agriculture (USDA). EPA could relate NPDES permit issuance to the jurisdiction's record in conforming to EPA's recommendations or to its record in maintaining agricultural lands. (See p. 4 for a description of the NPDES system.)

Effectiveness

Strong, if the federal agencies can assume approval, incentive or reward powers such as influence over NPDES permit issuance. Even a more modest federal role - limited to review and comment on agricultural elements - would help assure that local agencies take national interests into account when making decisions relating to prime agricultural land.

9. Agricultural Reserves.

Theory

One reason that maintenance of existing agricultural locations is difficult is that urban and public uses intrude on them, either directly or proximately. Adjacent residents complain about crop-dusting activity, air pollution from nearby autos affects the health of plants and animals, and public roads and other improvements occupy former farmland. In addition, the proximity of urban uses raises farm land values (in anticipation of future urbanization), thereby making agricultural use less profitable with respect to the value of the investment. Protection of farmlands from urban intrusion would help to maintain existing agricultural locations.

Implementing Agency

State government.

Application

Adopt a state law, similar to the New York law, authorizing the creation of agricultural reserves. The New York law provides for the creation of a reserve at the initiative of a group of landowners who have at least the designated minimum amount of land. If the reserve is granted by the state, the landowners gain a number of protections: limited liability for assessments by special districts, protection from public agencies' taking of district lands (e.g., for roads), eligibility of most lands within the district for agricultural value assessment and minimal state/local interference in farming activities. The New York agricultural reserves are initially approved for eight years; they are reviewed and may be modified or terminated at that time.

Effectiveness

Unknown; dependent on willingness of agricultural landowners to commit to the minimum period (in New York, eight years) of agricultural use. Could be only a short-term measure if landowners are not willing to renew the districts. Could be strengthened by the state's requiring that all prime land areas of a designated minimum size become agricultural reserves. The measure offers the advantage of assuring that a critical mass of agricultural activity is maintained, rather than just scattered farms.

10. State Regulation of Agricultural Land

Theory

Regulation of agricultural lands is argued to be most effective when imposed at the state level because it is then removed from local political pressures.

Implementing Agency

State government: legislature, governor and administering agency.

Application

Adopt state legislation which prohibits urban development on identified prime agricultural lands. The legislation should contain criteria and procedures for identifying prime lands, specify which lands (if any) are exempt from regulation and control uses on the remaining land.

Some states (in addition to New York) have already adopted or are studying measures to limit urban development on agricultural lands.* Oregon has a state level Land Conservation and Development Commission (LCDC), which has the power to establish land use guidelines to which local governments must conform. LCDC has established agricultural land retention as a statewide goal, and the commission calls on local governments to place agricultural lands in exclusive farm use zones. Land placed in such zones is taxed at farm use value (rather than fair market value) and accepted farming practices on it may not be interfered with. In addition, non-farming uses within the zones are restricted and proposed subdivision of parcels into less than ten acres is subject to review by the local government to test its consistency with the state's agriculture policy.

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*This discussion draws heavily on Fletcher, 1978.

Wisconsin has adopted what is apparently a more voluntary approach. Until September 1982, qualifying farmers may sign contracts with the state in which they agree not to develop their land; in return, their land is assessed at agricultural use value. After September 1982, urban counties must have zoning ordinances in effect with a category for exclusive agricultural use in order for farmers to be eligible for the reduced assessments; rural counties may have either exclusive agricultural zoning or a farmland preservation plan. Counties are not required to have such zoning ordinances or plans, but farmland owners in counties which do not meet the requirements of the program will not be eligible to receive the benefits described after 1982.

Three bills which would have established state regulatory control over the use of prime agricultural land were introduced into California state legislature in the 1977-78 session. The three, two of which were later consolidated, contained different definitions of prime agricultural land and proposed different regulatory structures. What they had in common, though, was a program which included (1) the identification of prime agricultural lands according to the criteria presented, (2) a procedure for exempting certain prime lands from regulation, (3) a state role in assuring that agricultural land identification and preservation programs - whether developed by the state or by local entities - would be consistent with the objectives of the bill, and (4) the restriction of prime agricultural lands to agricultural uses. The identified effects of these bills would have been to remove certain prime agricultural lands from the potential urban land supply and to alleviate some local political pressure related to that removal by establishing state review/appeal authority over the original location actions. None of the bills was passed by the legislature.

Effectiveness

Unknown; depends not only on the characteristics of the plans which are developed, but also on how well their provisions are enforced. The exemption of prime agricultural lands needed for short-term community growth could vitiate the effectiveness of the preservation program over time. Inclusion of non-prime lands among agricultural land subject to protection does not relate to the objective of retaining prime lands.

11. Federal Designation of Exclusive Agricultural Districts.

Theory

The Coastal Zone Management Act establishes a precedent for federal involvement in land use planning for the purpose of protecting scarce land resources. The federal government could also become involved in protecting prime agricultural land from urbanization by enacting new legislation similar to the state legislation described above.

Implementing Agency

U. S. government: congress, president and administering agencies (presumably USDA and/or EPA).

Application

Enact a law providing for federal protection/regulation of prime agricultural land. The law would designate a responsible agency (presumably USDA or EPA) to carry out its provisions. These provisions would, like the state legislation, include the establishment of criteria and procedures for identifying prime farmlands, specification of which lands would be exempt from regulation and methods for protecting/regulating the remaining prime lands.

Effectiveness

Unknown; dependent on exceptions to regulation and effectiveness of enforcement.

12. Condemnation or Transfer of Development Rights.

Theory

The entitlement (right to develop) conferred by zoning on a specific parcel of land is a powerful economic force, because the use permitted determines the value of the land. For example, land zoned for apartments is more valuable than land zoned for single family homes because apartments potentially produce more income for the land owner. Similarly, land zoned for virtually any urban use is more valuable than land zoned for agricultural use because the potential returns from urban uses are greater.

The viability of agricultural use is tied in part to the zoning on the land, because the land value is one factor in determining economic viability. Simply put, if the land has a high value - which could result from urban zoning - then the low financial returns from agricultural use would not justify maintaining the use at that location. If, however, the land has low value - e.g., there is no use other than agriculture to which it may be put - then the economic return from agricultural use is a higher proportion of the land value and may justify maintaining agricultural use.

The zoning ordinance, which allots entitlement to designated locations, is not necessarily effective in maintaining land in agricultural use, because it may be changed at any time. A potentially more effective measure is one which establishes conditions under which the entitlement for a specific location may be sold or transferred to another property. This concept, known as transfer of development rights, would both (1) provide that the landowner be compensated for the foregone value of whatever urban use would ultimately have been allowed and (2) remove all potential for future urban development on the land by withdrawing the entitlement to develop it.

Development rights pertaining to a given parcel of land can be either transferred or condemned. Transfer of development rights includes all mechanisms for removing the development right from one property and assigning it to another. Condemnation of development rights involves their acquisition by the government rather than by a private party. The condemned development rights may later be resold to another private landowner or may simply be retired by the governmental agency which purchases them rather than being assigned to another parcel of land. Condemnation also implies a mandatory action rather than a voluntary one; it would therefore be a stronger measure.

Implementing Agency

State government and local general purpose government.

Application

Enact a law establishing the rules for transfer or condemnation of development rights, including (1) eligibility for participation, (2) method of determining the value of development rights at various locations and (3) administration of the system. Administration would most likely involve both the state and local government. Compensation for the condemned development rights would be provided by the state while the local jurisdiction would have to be involved in allocation of transferred rights.

Some states have already begun to examine the feasibility of development rights purchase programs for retention of agricultural land. Maryland has enacted a law which combines the agricultural district and development rights transfer approaches. Under that law, landowners may petition the state to form agricultural districts; if the districts are approved, the owners agree to continue farming for five years in return for protection of the farm uses. The law also provides that a farmer may sell an easement on land within an established district to the state Agricultural Land Preservation Foundation. With sale of the easement, the farmer gives up the right to subdivide the land for development purposes other than for dwellings of the owner and family members. Easements are intended to be permanent but may be repurchased after 25 years by the landowner. (No money has yet been made available to the Foundation for the purchase of easements.)

New Jersey has undertaken a two-year demonstration program (approved in 1976) involving the purchase of development rights in Burlington County, in the southwestern part of the state. Eligible farmers interested in selling their development rights submitted non-binding bids to the state; the state, in turn, had the properties appraised to determine the difference between the farm value and the fair market value of the land (that difference is the amount the state would pay for the development right). As of April 1978 the state had identified the lands whose development rights it was interested in buying but had not decided to proceed with the purchase although funds were available. Response to the program, though, indicated a high level of farmer interest, suggesting that such a program would in fact be effective.

Massachusetts has also funded a pilot program for the purchase of development rights. Because the program is so new, however - funding was appropriated in 1978 - not much information about the program is yet available.

Effectiveness

For condemnation, effectiveness is strong because future development options are eliminated on properties whose development rights have been condemned. For transfers, effectiveness is unknown; it depends on the presence of a market to induce owners to sell or trade the development rights.

13. Compensable Regulation.

Theory

One reason agricultural landowners are so resistant to use restrictions on their land is precisely because those restrictions lower the potential sales price of the land by limiting the uses to which it may be put. If that price decrease could be offset, they would be less resistant to regulation which mandates use restrictions.

Implementing Agency

State government: legislature, governor and administering agency.

Application

Enact legislation providing for compensation to agricultural landowners whose lands are restricted to agricultural use. This compensation would be awarded at the time of sale of the land (which is the only time the actual value loss would be realized) and would be equivalent to the difference between the actual sales price and the price which could have been obtained if the use were not restricted.

Effectiveness

Strong if coupled with a strong prime agricultural land identification program.

14. Outright Purchase of Agricultural Land.

Theory

All the other measures to preserve prime agricultural land discussed in this section depend upon - and some mandate - cooperation of agricultural landowners and complicated administrative procedures. For many of them, it would take years to complete the background studies needed for implementation. A much simpler, though obviously costly, alternative is for the state to purchase the land outright.

Implementing Agency

State government: legislature, governor and administering agency.

Application

Enact legislation allocating state funds for purchase of identified prime agricultural lands. The legislation would have to contain provisions for identifying the lands to be covered. The legislation could provide either for purchase as funds become available (condemnation) or the right of first refusal when the property is put up for sale.

Generally, this measure would be implemented by state government; local governments typically lack the fiscal resources required to implement an acquisition program. One exception is the City of Boulder, Colorado, which has embarked on a land acquisition program as part of a growth management measure, with the purchased land to provide a greenbelt around the city. A 1% sales tax was originally (1967) used to provide funds for municipal land purchases. At an election in November 1971, voters approved a measure to accelerate the acquisition program by using the proceeds of revenue bonds, with the sales tax money earmarked to retire the bonds.

Effectiveness

Outright purchase gives the public agency complete control of the use of the land.

15. Purchase of Remainder Interest.

Theory

It may be argued that there is no immediate crisis in the availability of prime agricultural land. President Carter's statement that the farmland set-aside program would be "highly likely" to be continued in 1979 as part of the ongoing price support system for some farm products (especially feed grains, such as corn) would appear to lend weight to this argument. However, irrespective of the situation now, there may evolve a scarcity of prime agricultural land as the world's population grows (from 4 billion in 1977 to 6.7 billion in 2000) and more and more prime land is absorbed by other uses. Therefore, a reasonable approach to insuring that existing agricultural locations will be available when they are needed, sometime in the future, is to reserve the future right to them now.

Implementing Agency

State or federal government.

Application

Enact legislation to allocate funds for purchase of a remainder interest in prime agricultural land. Purchase of remainder interest by the government means that the government pays now to take over the ownership of the land at some specified time in the future (say, 40 years from now). The future price is discounted to present value, representing a significant price savings over the outright purchase option. The seller (current owner) retains the right to use the land as he pleases (consistent with local regulations) until the specified date at which ownership changes. At that date, the new owner (the state) assumes ownership and control over the land and whatever land uses are in existence; the state ultimately returns the land to agricultural use.

The legislation would have to describe means for identifying prime agricultural land and for administering both the purchase program and, in the future, the land.

Effectiveness

Depends upon the scale of the program. For lands upon which development takes place between the time the remainder interest is acquired by the public and the time title is transferred, effectiveness also depends on the technical feasibility of restoring the land to its original prime character.

D. Limit the Availability of Urban Infrastructure

Rationale. Zoning for urban use, which grants the entitlement for development on a given property, is a necessary but not a sufficient condition for urbanization. An industrial establishment could not, for example, be built in the middle of a cornfield: there would be no roads leading to it, no sewer or water service, no electricity or telephone; fire and police protection would probably be inadequate for an industrial plant. These kinds of services, both physical and social, are collectively known as urban infrastructure. Because they are required for urban development, limiting infrastructure availability is one way of controlling urban expansion.

Measures to Limit the Availability of Urban Infrastructure.

1. Establish an Urban Service Area for Short-term Growth.

Theory

A city may delineate the geographic area within which urban infrastructure will be provided. That area would encompass existing urban development plus a vacant land supply sufficient to accommodate short-term growth. Urban growth would be channeled to locations within the urban service area because urban infrastructure would not be available outside the area. This policy would encourage infill and contiguous development.

Implementing Agency

Local general purpose government and special purpose districts.

Application

Establish service areas for major urban capital facilities (particularly sewers and water supply lines); refuse to extend these services beyond the defined service areas.

Effectiveness

Highly effective in encouraging infill and contiguous development, increasing the efficiency of urban land use. Not a long-term agricultural land retention measure because the service area can be expanded over time in response to growth pressures. If the short-term supply of buildable land in the urban service area is too limited, spillover development may result.

2. Establish an Urban Expansion Area for Long-term Growth.

Theory

A city may delineate the geographic area within which it expects to accommodate its long-term growth. Lands lying outside that perimeter would not be subject to urbanization, even in the long run. Thus, those lands would not experience land value appreciation in anticipation of eventual urbanization, and land speculation would therefore be reduced. Under these circumstances, agriculture would be better able to survive.

Implementing Agency

Local general purpose government and special purpose districts. Policy coordination with the local agency formation commission would be necessary.

Application

A typical method is the delineation of a long-run (20+ years) water supply or sewer service area.

Effectiveness

Can be effective in reducing land value appreciation attributable to anticipation of urban development in the area lying outside the defined growth area. An excessively large long-term growth area (encompassing more land than would be needed for 20 to 25 years of growth) prematurely commits agricultural lands to development.

3. EPA Clean Water Grants.

Theory

EPA is one of the major providers of funds for new infrastructure through its Clean Water Construction Grants program which provides funds to cities for expansion and/or upgrading of their wastewater treatment facilities. Refusal to grant funds in prime agricultural areas would severely restrict the provision of urban infrastructure, in the form of sewage treatment capacity, and consequently limit future growth. More stringent EPA requirements for project sizing, siting and phasing in prime land areas could also help reduce agricultural land conversion.

Implementing Agency

EPA.

Application

(a) Adopt as a mandatory condition of the Clean Water Construction Grant program that no grants be made to communities located on prime agricultural land or to communities whose future growth is likely to occupy prime agricultural land; or

(b) for grantees in prime agricultural land areas, establish shorter staging periods for facility construction and require careful planning with regard to the amount of reserve capacity in major units of the wastewater system (such as interceptors); or

(c) specify land development controls to be adopted by grantees in prime agricultural land areas to assure that absorption of agricultural land resources by urban uses is minimized.

Effectiveness

EPA requires mitigation of adverse impacts on (including urbanization of) prime agricultural lands, but does not prohibit the award of grants to communities located in prime agricultural areas. No special set of regulations with regard to general issues of sizing and staging or to land development regulations has been developed for application specifically to prime land areas.

The effectiveness of such measures depends first on EPA's ability to attach them to grants and to enforce such stipulations once made. It also depends on the extent to which local agencies can fund their own projects, which they would attempt to do if EPA's conditions are too stringent. Local funding would relieve grantee agencies from any EPA-mandated obligation to protect prime farmland resources.

4. Restrict State and Federal Highway Aid.

Theory

The construction of roads through prime agricultural lands affects the agricultural use of those lands in several ways: (1) it uses up land which could be farmed; (2) it often divides farms into inefficiently-sized or -shaped parcels; (3) it raises land values, making the agricultural uses less profitable in relation to the value of the inputs; and (4) it potentially "opens up" the land to urban or suburban development by both providing access and increasing land value beyond that supportable by agriculture. Much of the road construction which occurs in agricultural areas is funded with state gas tax money or federal highway aid. If restrictions were placed on these funds, to discourage or prohibit their use in agricultural areas, they would cease to provide infrastructure which contributes to the conversion of prime farmlands.

Implementing Agency

State and federal government.

Application

Enact legislation either to (1) prohibit use of state and federal highway funds (including gas tax redistributions) for road construction projects which cross prime agricultural lands or to (2) restrict or prohibit the continued distribution of highway funds to jurisdictions which use them for such projects.

Effectiveness

Unknown; depends on whether the existing road system has already effectively opened up agricultural lands for urban development and whether local jurisdictions are able to tap alternative sources of funds for road construction and maintenance. (Alternative sources of funds would increase property taxes, bond issues, special assessments and user fees such as tolls.)

5. *Federal Regional Council Coordination*.

Theory

A Federal Regional Council (FRC) has been established in each region of the United States whose members are drawn from the federal agency offices in that region. The function of the FRC is to coordinate the policies and actions of federal agencies in that region. Because this group has a unique overview of all federal governmental activities, it is in a good position to monitor those activities with respect to their implications for prime agricultural lands.

Implementing Agency

Federal government.

Application

Adopt a policy to discourage or discontinue federal agency actions which would adversely affect the continued agricultural use of prime farmlands. Adverse effects may be anticipated particularly when a federal action would provide new infrastructure usable for urban development.

Effectiveness

Depends on the direction given to the Federal Regional Councils by the administration and on the direction given to participating agencies by their heads.

E. Promote Agricultural Uses

Rationale. Thusfar, the discussion of agricultural land retention measures has focused on ways of discouraging urban expansion onto agricultural lands. Another approach to farmland protection recognizes that agricultural uses are difficult to maintain because of competition for resources and because of problems with their own economic viability. The measures discussed below suggest actions which could be taken to strengthen the competitive position of agriculture with respect to resources and to help it gain a better economic return.

Measures to Promote Agricultural Uses.

1. Bring New Agricultural Lands into Production.

Theory

The most vital agricultural resource, and the one for which agriculture uses seem least able to compete, is the land itself. One way to offset the loss of agricultural land to urban uses is to require those converting existing prime land to urban use to "replace" it by bringing new agricultural land into production.

Implementing Agency

State government.

Application

Enact legislation establishing a state-administered, developer-financed reclamation program for agricultural lands. This program would involve (1) identification of lands to be reclaimed, (2) condemnation of those lands, (3) purchase of the lands at their present values and (4) development of a reclamation plan. Purchase and reclamation as well as administration of the program would be funded by mandatory developer contributions assessed on a per acre (of developed land) basis when new developments are undertaken on prime agricultural land. The effect of this program and funding arrangement would be to provide a "bank" of land reclaimable for agricultural use, with new acreages put into use as existing agricultural lands are removed to urban use.

A state-administered program offers considerable advantages over a similar approach administered at the county level, among which may be mentioned lower initial land cost, assurance of provision of a critical mass of new agricultural land, more efficient soil reclamation practices and uniform state-wide regulations and procedures.

Effectiveness

Strong. Proper implementation and administration would assure replacement of lost prime lands on a one-for-one basis. It is not clear, however, (1) whether reclaimed soils would have the same versatility and resilience as prime soils or (2) how large the supply of reclaimable soils really is.

2. Put Purchased Agricultural Land to Agricultural Use.

Theory

One of the mitigation measures suggested above was the outright purchase of prime agricultural lands by the state. These lands could continue to be used for agriculture after their purchase under a variety of arrangements.

Implementing Agency

State government.

Application

(a) The state agency with jurisdiction over the purchased land could lease it back to bona fide farmers at lower-than-market rents. This type of program would both reduce the effective cost of lands to the state (because it would make them income-producing properties rather than idle open space) and reduce the expense of farming, thereby making it more profitable.

(b) The state could use the purchased prime agricultural land for such purposes as training farmers or conducting agricultural experiments and demonstration projects.

Effectiveness

A leaseback program would be effective in making land available to those wishing to farm it and in generating income to offset the costs of a public land purchase program. The effectiveness of alternative uses, such as measure (b) described above, in promoting agriculture is unknown.

3. Growth of Cooperatives.

Theory

Uncertainty regarding the availability and size of markets is one factor reducing the economic viability of agricultural enterprises. Commercial canneries are less and less frequently willing to make advance commitments to growers relating to the amount of produce they will buy in any given year. Because farmers compete with each other for sales, all run the risk of overplanting the crops they perceive to be in demand and being stuck with surplus crops. Further, because of canning expense and uncertainties regarding future demand for canned goods, canneries are often not willing to pay the prices required to make agriculture a competitive land use. Farmers would be in a better economic position - and therefore better able to continue to farm - if they could eliminate the private cannery's intermediate role in food production.

The private cannery could be replaced by growers' cooperatives. Operation of cooperatives would help make agriculture more viable by (1) enabling the coop to assign (or agree to) established amounts of specific crops, thereby reducing or eliminating the risk of overplanting, and (2) distribute net profits directly to members rather than having to pay an outside intermediary (the private canner).

Implementing Agency

Federal to state government.

Application

Provide financial and technical assistance to groups of farmers to encourage the growth of cooperatives. Technical assistance would include education related to business organization, economics and operation.

Effectiveness

Private canneries are currently only marginally profitable operations; the distribution of their profits to farmers would not be likely greatly to alter the farmers' economic position. However, certainty of a market for production would be of considerable assistance to growers who have flexibility in determining their mix of crops. Coops have been established in a number of product lines.

4. New Merchandising Techniques.

Theory

Canning is a low-profit operation. Canned fruits and vegetables represent a declining share of the processed food market. The development of an alternative packaging form which would find acceptability in more profitable markets would allow processors to make more money on their output and pass some of the accompanying benefits - a portion of that profit and/or reliable demand commitments - on to the producers. These benefits would act in the same manner as cooperatives to reduce uncertainty and to make agriculture more viable.

Implementing Agency

State or federal government; both have agricultural research programs.

Application

Provide economic support, technical assistance and research efforts to assist in the development of new processing and merchandising methods for agricultural products. An example of the kind of useful results such efforts can yield is provided by a 1979 announcement of a new canning process developed by University of California, Davis, researchers, which permits canning with a higher fruit-to-fluid ratio and a marked improvement in flavor.

Effectiveness

Unknown; depends upon consumers' reactions to new processing and packaging methods. It is questionable, too, whether consumers are likely to be willing to pay enough more for food products, even with new methods, to support prices at a level which would make agriculture a significantly more viable endeavor.

5. *Intermediate Technology for Agricultural Production.*

Theory

Efficiency of farm production in the United States has increased greatly over the years as new and better machinery has been developed to assist farmers in all phases of production. This machinery has generally been designed for large farms.

Agriculture in many areas of the county is characterized by small farms. A problem of operating a small farm at a profit is the relative lack of technology (such as machinery) suitable to small farms. This void could be filled by the development of farm machinery designed for small farms; such machinery would reduce labor costs and improve productivity.

Implementing Agency

Federal or state government.

Application

Provide economic and technical support for the development of machinery designed for and affordable by small farms.

Some observers (for example, California Employment Development Department, 1977) have noted a systematic bias in university and cooperative extension research and service programs toward the interests and needs of large farms, and have advocated a re-orientation of these programs to provide more effective assistance to smaller and/or family-operated farms.

Effectiveness

Unknown.

6. National Prime Agricultural Land Policy.

Theory

One ongoing problem in the attempt to preserve prime agricultural land is that preservation does not have an identifiable constituency. Farmers, who have historically counted on being able to sell portions of their land when money was scarce or they wanted to retire, have generally opposed regulation of their lands. Conservation groups, lacking adequate resources to address all issues, have focused on the more visible ones. One result of this lack of a constituency, though, is that legislators and executive government officers have had no motivation to take actions to halt the conversion of prime lands to urban uses.

The situation could change if an interested federal agency were to implement a Prime Agricultural Land Policy designed to stem conversion. The adoption of such a policy would help to crystallize the agricultural land retention issue and make it explicit to legislators, their constituents and the federal and state agencies which administer programs which affect or potentially affect prime agricultural land.

A Prime Agricultural Land Policy which focuses on retention of those lands would presumably have to be based on a finding that the benefits of retention outweigh its costs. A study which would be required to assess costs and benefits of retention is discussed subsequently.

Implementing Agency

One or more federal agencies with interest in agricultural land. The Department of Agriculture (USDA), the Environmental Protection Agency (EPA) and the Council on Environmental Quality (CEQ) all have such interests.

Application

Adopt a Prime Agricultural Land Policy which recognizes the importance of preserving prime agricultural lands and identifies actions which if taken, will aid in preserving such lands. These actions could include:

(a) The assumption by a federal agency of the role of advocate for prime lands. This role would be carried out in the Federal Regional Council and other interagency and intergovernmental arenas;

(b) Expansion of environmental reviews to include state and local documents as well as federal EIS's;

(c) Shifting of grants for capital expenditures from new or expanded facilities in growth areas to the renovation and replacement of facilities in older urbanized areas;

(d) Consideration of the effects on prime farmlands of all funded programs and activities, accompanied by efforts to minimize those effects in all cases; and

(e) Mounting of a program to enhance public awareness of the costs and benefits of preserving prime agricultural land.

Effectiveness

Agricultural land policies have been articulated by three federal agencies with an interest in agricultural and land resource issues: USDA in 1976 and 1978; CEQ in 1976 and EPA in 1978. These policies generally cover a wide variety of productive lands - including range and forest lands - not all of which are prime or potentially prime farmlands. Mechanisms for policy implementation are in evolution. The effectiveness of the policies depends on the strength of the implementing actions and the degree to which compliance standards are adhered to and enforced. Effectiveness of a prime agricultural land policy may also be difficult to distinguish from the effect on prime land retention of discontinuing other policies which have adverse effects on prime lands.

7. Assure Adequacy of Future Water Supplies.

Theory

One resource constraint which is predicted to affect agriculture in upcoming years is the supply of water. As urban population grows and the water supply remains the same, states relying on water supply projects for irrigation water can expect to have access to less and less of the total amount of water. With a shrinking supply, agriculture will become more expensive and less economically viable.

Implementing Agency

State and federal governments.

Application

To assist in retaining agriculture's current viability wherever production depends on irrigation, programs are needed to assure agriculture's future water supply. These programs would include conservation, reclamation and development of new supplies. Examples of conservation programs would include (1) developing new, more efficient methods of irrigation, (2) ceasing to irrigate pasture lands and other non-prime lands, (3) developing crop strains which require less water than currently-grown strains and (4) growing less water-consumptive crops. Reclamation programs might include treatment of wastewater to a quality at which it could be reused for domestic and/or agricultural purposes. Provision of new water supplies might include (1) the allocation of rights to new groundwater supplies to agricultural users, (2) the allocation of water from new state or federal water projects to agriculture and (3) the reprogramming for construction of state water projects previously planned but now set aside because of other undesirable impacts, primarily environmental and economic.

Effectiveness

Unknown. In general, constant or increased availability of water could be expected to maintain but not enhance the current viability of agriculture. Where irrigation is being newly-applied in certain areas (as is currently the case in the Corn Belt states), assuring a reliable long-run water supply would improve agriculture's staying power.

F. Use Tax Policy to Protect or Encourage Agricultural Activity

Rationale. Tax policy can be used to alter the feasibility of investment in any given activity through the application of credits, deductions or penalties for such investment. For example, the federal government encourages long-term investments by taxing the profits on them as capital gains rather than ordinary income and encourages investment in oil resources through the oil depletion allowance. California encourages investments in solar energy equipment by allowing a substantial percentage of its costs to be taken as a credit against tax liability. Property tax rules encourage homeownership by allowing owner-occupants a deduction from the assessed valuation of their homes when the tax is computed. These types of incentives could be used to encourage agricultural uses and/or discourage urban uses on prime agricultural lands.

Measures to Make Tax Policy Encourage Agricultural Activity/Discourage Urban Use of Prime Land.

1. Differential Assessments for Property Tax Purposes.

Theory

One of the cost factors in agricultural production is property taxation. One reason that property taxes have historically been problematic for farmers is that their properties have been assessed according to the "highest and best use" - that is, the use which would allow the greatest return - rather than the actual agricultural use. Because the highest and best use in areas where urban growth pressures exist is often urban, taxes have been high enough to be the "straw that breaks the farmers' backs". There have been documented cases of farmers who found it more profitable to pull out their orchards than produce fruit because the revenues from the crop would not exceed their costs when trees were assessed as improvements and the land assessed at highest and best use value.

Implementing Agency

State government.

Application

Generally, it is the responsibility of state government to establish assessment standards and practices, which are then implemented at the local level. Changes in assessed value to market value rates or distinctions among types of land uses with regard to valuation methods would have to be authorized by legislation.

Among possible approaches are the following:

(a) Assess farm properties at their agricultural use value instead of highest and best use value.

(b) Assess farm properties at a lower percentage of full market value than applies to non-farm properties.

Variations of these approaches have been implemented in several states. In general, the tax break offered to farmland owners is tied to a commitment on the property owner's part to maintain the agricultural use, generally by placing it, under contract, in a farmland preserve.

California's Williamson Act (the California Land Conservation Act, 1965) permits, but does not require, counties to establish procedures under which farmland may be assessed at agricultural use value. These procedures call for the signing of a contract between the county and the landowner; in return for the lower assessment, the owner agrees not to develop the land during the 10-year period of the contract. If the land is developed, the contract is considered broken and the taxes which would have been assessed had the contract never been signed become due.

The State of California provides a property tax reimbursement to local governments whose revenues are adversely affected as a result of the Williamson Act. However, state reimbursement is estimated to cover only about half of the tax loss. The local cost of this kind of differential assessment program has prevented some of California'a major agricultural counties (e.g., Merced) from implementing the measure. This problem is likely to be encountered in agricultural areas where the property tax is the principal source of local revenue.

Effectiveness

Slight. Experience with Williamson Act contracts has not proven that they are an effective method of preserving agricultural land. One reason is that the contracts are voluntary; because not all owners choose to enter into them, they do not prevent scatteration of urban development throughout rural areas ("buckshot", "leapfrogging" or "checkerboard" development patterns). Another reason is that the urban price of the land, when sold, will more than cover any tax penalties which may be assessed. Finally, Proposition 13, by reducing all property tax rates in California, has greatly reduced the incentive for farmers to enter Williamson Act contracts by providing equivalent or better tax relief with no accompanying restrictions on land use.

The Williamson Act also applies to a wide variety of lands, including non-prime agricultural land and including nonagricultural uses (such as resource uses like forests). Differential taxation systems, if they are to work as a prime agricultural land retention measure, would have to be confined in their application to lands meeting the definition of prime. Such systems would also be most cost-effective if limited to areas actually facing significant development pressures. Finally, penalties for breaking contracts would have to be high enough to function as a deterrent to urban conversion. A differential taxation system with these features would have to offer irresistable incentives in order to attract farmland owners to participate on a voluntary basis.

2. Deferred Taxation of Agricultural Lands.

Theory

If lower taxes, such as may be provided under differential assessment measures (Measure F-1, preceding), are favorable to farmers, then no taxes at all would be even better. If payment of property taxes on agricultural lands were completely deferred until the lands were sold, then (1) the farmers' cash flow situations would be improved as long as the land was held and (2) the prospect of paying accumulated taxes upon sale could act to deter farmers from selling their lands.

Implementing Agency

State of California.

Application

Enact legislation which provides that property taxes on agricultural land be deferred until the property is sold. The legislation would have to allow for state reimbursement of foregone revenues by counties, with the accumulated deferred tax payments to be repaid later to the state.

Effectiveness

Unknown. Depends on whether (1) economic viability would be enhanced enough to encourage farmers to continue agricultural use; (2) the prospect of paying accumulated taxes would discourage sales; and (3) the propensity of landowners to circumvent sales while allowing urban development of their lands (e.g., through leasehold arrangements). There may be situations in which the value of the agricultural land, when sold, is not high enough to pay the deferred taxes, which would mean a net loss in property tax revenues to the state.

3. Apply Value Capture Technique to Lands Benefiting from Public Investment.

Theory

When public funds are expended to construct a public facility, one common result is an increase in the value of abutting lands, which is often called a "windfall". In the case of wastewater facilities, the construction of a new interceptor or collection system opens the land to urban development, thereby generally increasing the price a buyer is willing to pay for it. The return to the public treasury of part or all of the windfall gain resulting from a public investment is what is involved in a value capture policy.

Implementing Agency

State government: enabling legislation would be required in most states to permit implementation by local agencies.

Application

Because of restrictions placed on the sale of land which passes into public ownership via condemnation, it can be difficult to establish a legally-viable value capture technique. Some of those which have been implemented include: (1) purchase by a public agency of more land than the proposed public improvement will require; the agency later declares the land surplus and sells it at a profit (capturing the windfall); (2) establishment of special benefit assessment districts around the public improvement to tax away part of the windfall; and (3) direct participation of the public agency in land development (such as transit agency development near a transit stop or port agency development at a port site). No cases of value capture relating to wastewater facilities came to light in a literature search on this subject.

Effectiveness

Legal and administrative problems may be difficult to overcome. Even if they can be overcome, the effect of the measure would not necessarily benefit agriculture. Its direct effects would fall on all landowners adjacent to the new facility, who are as likely to be farmers as speculators. The taxing away of their windfall gain does not necessarily encourage a continuation of the land in agricultural use, and may discourage agriculture if the farmland owner is financing farming operations in part by borrowing against his equity in the land, because the taxing away of appreciation in value reduces his borrowing power.

4. Finance Agriculture with Capital from Non-agricultural Sources

Theory

Federal income tax rules could be revised to favor investment in agriculture. For example, giving non-agricultural corporations a tax break - in the form of a credit or a deduction - for investment in agricultural land and operations would give them an incentive not only to invest in agriculture but also to retain agricultural lands in agricultural use (rather than allowing them to be converted to urban use).

Implementing Agency

Federal government.

Application

Alter federal income tax rules to provide corporate income tax credits to corporations which invest in agricultural lands and/or operations.

Effectiveness

Unknown. Depends on corporations' needs for tax shelters and the acceptability of agricultural investment to their directors and shareholders. A possible adverse side effect of this measure is the potential deterioration of farmland quality. Agricultural land owned by non-agricultural corporations would be likely to be operated by professional farm operators. If these non-owner operators do not observe the same careful cultural practices as owner operators are presumed to observe, land quality could deteriorate more rapidly than it would otherwise.

5. Alter Tax Rules for Industrial Investment.

Theory

Federal income tax rules are currently structured to encourage private investment in the development and maintenance of industrial activities. When these activities are located on prime agricultural land, the tax structure has acted to encourage conversion of that land. Alteration of the tax rules to penalize investors in industries which locate on prime agricultural land could act to discourage the selection of such sites in favor of sites in already urbanized areas or on non-prime soils.

Implementing Agency

Federal government. Also state governments which impose income taxes on corporations.

Application

Alter tax rules to penalize industries which establish new facilities on prime agricultural land. Penalties could be assessed as a tax surcharge or in some other form.

Effectiveness

Depends on the magnitude of the penalty.

6. Restructure Formula for Distributing Sales Tax Revenue.

Theory

Local governments often try to attract commercial development in order to increase local revenues from the sales tax. If such revenues were subject to a redistribution on some basis other than the point of sale of the taxable goods, cities surrounded by agricultural land would not be driven to seek commercial development.

Implementing Agency

State government.

Application

Establish a formula for distributing sales tax revenue that is unrelated to the amount of commercial use in a jurisdiction. Alternative bases for distribution might be number of residents, number of households with below poverty level incomes or density of urban uses.

Effectiveness

Unknown. This is a very indirect method of promoting agricultural land development. It operates via a disincentive to retail development. Most of the direct competition for agricultural land resources comes from residential development.

G. Needed Studies

Rationale. The choice and/or assignment of the mitigation measures for particular situations would benefit from broader knowledge of existing conditions in the areas affected and the potential trade-offs involved in mitigation. The need for further study has been explicitly mentioned in the discussions of several of the measures presented; it has been implicitly suggested wherever the direct effect of a mitigation measure would be offset by undesirable indirect effects, such as spillover development. The results of further studies would include both increasing our knowledge with regard to prime agricultural land and its benefits and a more complete framework for analyzing and projecting the implications of measures actually implemented.

Studies Needed for Additional Consideration of Mitigation Measures.

1. Cost/Benefit Analysis of Prime Agricultural Land Preservation.

Theory

The adoption of a national prime agricultural land policy proposed above (Measure E-6) was predicated on a finding that the benefits or prime agricultural land retention outweigh the costs of retention.

The preceding discussion of mitigation measures makes it abundantly clear that prime agricultural land preservation would not be a cost-free policy. While costs of implementing the measures described have not been presented, they have been estimated in some cases and are fairly readily ascertainable in most others. Much less information is available on the benefit side of the calculation, both with regard to quantification of benefits (the first prerequisite of benefit estimation) and with regard to the assignment of probabilities to future levels of need for prime agricultural land (the second prerequisite of benefit estimation). Therefore, in order to examine a complete picture of both costs and benefits, an in-depth study of prime agricultural land preservation and its effects would be helpful.

Implementing Agency

Federal government.

Application

Structure and fund an in-depth study of the costs and benefits of preserving prime agricultural land. The cost analysis portion of the study would include consideration of not only the adverse side effects identified in the foregoing discussions but also indirect costs, such as higher prices for land and housing, mentioned in the introduction to the mitigation measures portion of this chapter.

The benefit of preserving prime agricultural land can be described from an economic perspective as the difference between what consumers pay for food and fiber products with and without the preservation. Benefits are difficult to quantify for a number of reasons. Increases in yields are possible (overseas as well as in the United States); continued increases in yields would reduce the effective benefit of a preservation policy. If food shortages develop - and prices rise in response to shortages in supply - currently idle lands might be brought into cultivation (thereby reducing the apparent benefit of a preservation policy), but the timing of future shortages is difficult to forecast, and prices are likely to be influenced by government action. The benefits of preservation could be estimated in terms of replacement cost: the level of investment required to develop a new prime agricultural land resource. Replacement is currently being impeded in part by reluctance to undertake new water projects, which is in part due to the recognition of their environmental costs.

Food and fiber supply and price are not the only factors to be considered in benefit estimation. There are environmental benefits as well which require consideration in a cost/benefit analysis. These benefits include protection of watersheds and other environmental resources; aesthetic, scenic and cultural resource protection; and air quality amelioration among others. All these factors would have to be estimated in order to arrive at a quantification of the benefits of a prime agricultural land preservation policy.

The second prerequisite of benefit analysis is the assignment of probabilities to future levels of need for prime agricultural lands. Probability coefficients would have to be determined reflecting the likelihood that shortages of food and fiber might arise from a failure to preserve our agricultural land. Development of reasonable probability coefficients faces many of the same problems as the estimation of benefits. However, a prime agricultural land preservation policy is difficult to defend without a benefit calculation, particularly when those affected by such a policy are likely to be well aware of its costs.

Effectiveness

Very effective for identifying the trade-offs inherent in an agricultural lands preservation policy and serving as a basis for either pursuing or rejecting such a policy, depending on its findings.

2. Comparative Inter-city Analysis of Prime Agricultural Land Retention.

Theory

Modesto is one of many cities throughout the United States surrounded by prime agricultural land. These cities share the predicament of inevitably converting prime agricultural lands to urban use whenever any new development is undertaken.

Developing a program for mitigating prime agricultural land conversion would be facilitated if a comprehensive comparative evaluation of the performance of these cities with regard to agricultural land absorption were available. Historic performance in prime agricultural land retention may well vary widely even among cities in similar contexts. The cities which have been more successful in retaining prime agricultural land provide a standard of performance for those less successful.

Implementing Agency

Federal government.

Application

Structure and fund studies to develop a data base relevant to the development of prime agricultural land retention performance standards for American cities and counties.

Relevant data items would include but not be limited to (1) overall density, (2) infill opportunities within the urbanized area, (3) proportion of prime agricultural land in the surrounding area, and (4) optimal minimum conversion coefficient (that is, the best performance that could reasonably be required in minimizing the acreage converted per amount of population added).

The emphasis on quantitative measures of performance is vital to an accurate evaluation of the effectiveness of prime agricultural land retention programs. While a great many such programs have been implemented, very few have been analyzed for effectiveness using accepted land economics research techniques. The success claimed by many of them relates more to political and administrative issues (interesting elective bodies in the issue and persuading them to act) than to performance in the field. Relevant questions are, (1) have the programs made a measurable difference in the rate or amount of agricultural land loss due to urbanization? and (2) what local circumstances - organizational, economic, resource-related - have been implicated in a program's success?

Context is highly relevant to such an analysis of local farmland retention programs. "Success" in a rural county not experiencing any development pressures is unremarkable and irrelevant. On the other hand, conversion of thousands of acres at the perimeter of a rapidly-growing city does not necessarily indicate failure. In fact, it could meet the criterion of success *if conversion is markedly less than it would have been* in the absence of the specific local programs being evaluated.

Effectiveness

Would provide the basis for the development of performance standards for cities and counties in protecting prime agricultural land resources.

H. Performance Standard for Urban Growth in Prime Land Areas.

Rationale. The mitigation measures described above all focus either on regulating some aspect of urbanization or agricultural use of land or on altering the relative costs and benefits of urban versus agricultural land uses. An alternative approach, known as a performance standard, focuses instead on the effects a land use or a pattern of land development would have on its environment. This approach is very flexible and may be adapted to apply to local governments in many different types of situations.

A well known application of the performance standard concept is that which assigns zoning based on the effects of a proposed land use in a specific setting, establishing the level of effect that is considered acceptable (may not be exceeded if the use is to be approved).

With regard to prime agricultural land retention, the performance standard would test the land utilization efficiency of a city by establishing a minimum collective density of new development on prime agricultural land over time, thereby ensuring that prime agricultural land not be developed in a wasteful manner. A suitable indicator of land utilization efficiency is the coefficient of conversion: the amount of prime agricultural land converted to urban use per unit of population growth. The coefficient of conversion calculated for any individual city would vary depending on the time frame investigated; it is a dynamic measure which reflects historic as well as current conditions and practice.

The conversion coefficient performance standard may be supplemented by static measures such as gross urban density, gross residential density, availability of infill opportunities, etc., all of which are observations tied to a single point in time. Minimum density levels and maximum feasible utilization of infill sites might be established as threshold requirements prior to application of a conversion coefficient performance standard.

Measures to Implement Performance Standards.

1. Establish Threshold Standards of Performance Relating to Density and Infill.

Theory

The prime land conversion coefficient applies to *future* development on prime agricultural land; application of a conversion coefficient performance standard does not address the problem of *existing* inefficiencies in development patterns. When overall urban densities are low and significant infill opportunities exist, cities could take steps to ensure that future development be guided in a manner that will utilize infill sites and increase overall densities before activating the conversion criterion.

Implementing Agency

Individual cities at their option or as mandated as a condition of EPA or other federal grants.

Application

Most cities' general plans advocate infill and efficient land utilization patterns, and many cities (including Modesto) are implementing both regulatory and incentive measures to encourage increased density and infill. Conditions on state grants (see Measure C-6, California's Urban Strategy) and on federal grants encouraging or mandating such measures could provide an effective incentive. For example, EPA could require that a grantee agency, as part of the Step 1 Clear Water Grant, develop a program of compliance with infill and density standards. If (or when) a compliance program acceptable to EPA were adopted, EPA would proceed with Step 2 grant processing. Cities could develop compliance programs to suit local conditions.

Effectiveness

Standards of performance with regard to density and utilization of infill sites would be helpful in improving the efficiency of a city's existing land use pattern. Cities could be required to make such improvements as a condition of state and/or federal funding programs. Because the developability of infill sites varies widely within and among communities, and because the opportunities for development also vary, the success of this policy will vary widely. It is likely to be most successful in fast-growth areas.

2. Establish a Conversion Coefficient Performance Standard.

Theory

The requirement that a city minimize agricultural land conversion resulting from growth will necessitate the development of a methodology to evaluate its performance. A possible measure is the index of historic conversion per unit of growth. The research arm of the U. S. Department of Agriculture has used the coefficient-of-conversion measure in comparative studies of land use change on a county basis (see, for example, *Dynamics of Land Use Change in Fast Growth Areas*, Economic Research Service, USDA, 1976). This measure could easily be adapted to use in performance evaluation.

Implementing Agency

Local, state or federal government.

Application

The agency conducting the performance evaluation compiles data from at least two points in time disclosing the level of growth (for example, the population increase) and the change in agricultural land (acres of agricultural land developed into urban uses over that time period). A coefficient of conversion can then be calculated for the purpose of (1) comparison with other jurisdictions or (2) establishing a performance standard for the future in the same jurisdiction. Once the standard is established, a monitoring system should be set up so that compliance with the standard can be tested.

An EPA grantee can be mandated to maintain or improve its historic performance in converting prime agricultural land to urban use. Monitoring could be tied to issuance of wastewater discharge permits under the National Pollutant Discharge Elimination System (NPDES). These permits are granted by Regional Water Quality Control Boards (RWQCB's) but their issuance is subject to review and monitoring by EPA. In fact, this joint federal-state role suggests that responsibility for monitoring grantee compliance could be shared between the two agencies or delegated to the RWQCB.

NPDES appears to be the logical vehicle for a monitoring program because the permits may be issued for varying lengths of time. This monitoring approach would suggest that cities applying for permit renewals would have to demonstrate that they were meeting the performance standard established for prime agricultural land conversion.

If the city were not meeting the standard, it would have to propose a program to make up lost ground - for example, through infill programs or density increases - during the subsequent permit period. EPA would have the option of shortening the new permit period so that compliance could be reviewed after a shorter interval.

Effectiveness

Can be very effective in setting a limit to the degree to which population growth results in prime agricultural land conversion. Effectiveness depends on the conversion coefficient established as the standard and on the local government's commitment to observe the standard.

If the standard is imposed as a grant condition, neither the standard itself nor the monitoring system should be so onerous as to cause potential grantees to forego EPA funding; if cities self-fund their wastewater facilities, EPA's opportunity to encourage prime agricultural land retention is lost.

Conclusions

Cities surrounded by prime agricultural land have an obligation to conserve that resource and use it with maximum efficiency in view of the fact that its supply is limited.

Among other things, that means that priority should be given to developing non-prime lands first; that infill (even of prime lands) should take precedence over fringe development on prime lands; that density levels should be relatively high compared to cities in non-prime land areas; and that cities on prime land should be able to measure and monitor the impact of their growth on prime agricultural lands over time.

The comprehensive inventory of mitigation measures discussed critically in this chapter are presented in summary form in Table 5-10. For each measure, the matrix identifies (1) the level(s) of government responsible for implementation, (2) whether it would be implemented as a regulation or an incentive (or, in a few cases, either or both), (3) in what time frame it is considered implementable, (4) whether the approach is direct or indirect and (5) the likely effectiveness of the measure when a judgment can be made based on information available now.

The reader should note that the assignment of a time frame for implementation assumes that a measure is feasible and considers both the time it would take to adopt the measure and the time needed to make it operational once it is adopted. If a measure's effectiveness is indicated to be uncertain, that generally means (1) contextual factors will have a great influence on effectiveness or (2) the specific features of a type of measure would determine its degree of effectiveness.

Table 5-10

PRIME AGRICULTURAL LAND MITIGATION MATRIX

	MEASURE PROPOSED	IMPLEMENTATION			TYPE OF MEASURE[1]		ORIENTATION		APPROACH		WHEN IMPLEMENTABLE[2]		LIKELY EFFECTIVENESS			DISCUSSION PAGE
		LOCAL	STATE	FEDERAL	REGULATION	INCENTIVE	URBAN	AGRICULTURAL	DIRECT	INDIRECT	SHORT RUN	LONG RUN	STRONG	SLIGHT	UNKNOWN	
A	*Affect the amount of urban development*															
1	Limit the amount of land zoned for urban development	●			●		●		●		●		●			124
2	Limit number of building permits issued	●			●		●		●		●				●	125
3	Limit industrial growth generators	●			●		●			●	●				●	126
B	*Affect the density of development*															
1	Low minimum lot sizes in urban areas	●				●	●		●		●				●	127
2	High minimum lot sizes in rural areas	●			●			●	●		●		●			128
3	Maximum lot sizes in urban areas	●			●		●		●		●		●			128
4	Minimum neighborhood densities in urban areas	●			●		●		●		●		●			129
5	Infill development in urban areas	●			●	●	●		●		●		●			130
6	Cluster development in urban areas	●				●	●		●		●				●	131
7	Cluster development in rural areas	●			●			●	●		●			●		132
C	*Affect the location of urban development: control urban locations*															
1	Growth on or toward non-prime lands	●			●		●		●		●				●	133
2	Prohibition of subdivision on unincorporated lands	●			●		●		●		●		●			134
3	Eligibility for housing programs		●	●	●	●	●			●		●			●	135
4	Eligibility for community development/redevelopment aid		●	●	●	●	●			●		●			●	136
5	New towns or satellite towns		●	●		●	●			●		●			●	136
6	Urban Strategy		●		●	●	●			●	●				●	137
	Affect the location of urban development: maintain agricultural locations															
7	General plans	●			●			●	●		●				●	138
8	Federal (and/or state) review of general plan elements		●	●	●			●	●		●				●	139
9	Agricultural reserves		●		●	●		●	●		●				●	140
10	State regulation of agricultural land		●		●			●	●			●			●	141
11	Federal designation of exclusive agricultural districts			●	●			●	●			●			●	143
12	Condemnation or transfer of development rights	●	●		●	●		●	●			●	●[3]		●[3]	143
13	Compensable regulation		●		●			●	●			●	●			145
14	Outright purchase of prime agricultural land		●		●			●	●			●	●			146
15	Purchase of remainder interest		●	●	●			●		●		●			●	147
D	*Limit the availability of urban infrastructure*															
1	Establish an urban service area for short-term growth	●			●		●		●		●		●			148
2	Establish an urban expansion area for long-term growth	●			●		●		●		●		●			149
3	EPA clean water grants		●	●	●		●			●	●				●	149
4	Restrict state and federal highway aid		●	●		●	●			●		●			●	150
5	Federal Regional Council coordination			●	●		●	●	●	●		●			●	151
E	*Promote agricultural uses*															
1	Bring new agricultural lands into production		●		●	●		●	●			●	●			152
2	Put purchased agricultural land to agricultural use		●		●	●		●	●			●	●			153
3	Growth of cooperatives		●	●		●		●		●		●		●		154
4	New merchandising methods		●	●		●		●		●		●			●	154
5	Intermediate technology for agricultural production		●	●		●		●		●		●			●	155
6	National (and/or state) prime agricultural land policy		●	●	●	●		●	●		●				●	156
7	Assure adequacy of future water supplies (conservation, reclamation, new projects)		●	●		●		●		●		●			●	157
F	*Use tax policy to protect or encourage agricultural activity*															
1	Differential assessments for property tax purposes		●			●		●		●	●			●		159
2	Defer taxation of agricultural lands		●			●		●		●	●				●	161
3	Apply value capture techniques to land benefiting from public investment	●	●			●		●		●		●			●	161
4	Finance agriculture with non-agriculturally derived capital			●		●		●		●		●			●	162
5	Alter tax rules for industrial investment		●	●		●		●		●		●			●	163
6	Restructure formula for distributing sales tax revenue	●	●			●	●			●		●			●	163
G	*Needed studies*															
1	Cost/benefit analysis of national prime agricultural land preservation			●							●					164
2	Comparative inter-city analysis of prime agricultural land retention			●							●					166
H	*Performance standards for local growth*															
1	Threshold conditions	●	●	●	●		●		●		●		●			168
2	Conversion coefficients	●	●	●	●		●		●		●		●			169

[1] The implementation of some measures could be accomplished via either regulation or incentive.

[2] Assumes feasibility. Assignment to a column reflects judgment of time needed to establish operation/administration. "Short run" includes state and federal measures already in effect.

[3] Condemnation strong; transfer unknown.

Source: Gruen Gruen + Associates

Modesto's Agricultural Land Conversion Mitigation Program

The evolution of this environmental impact statement included a review by EPA and the City of Modesto of the city's past performance in developing and implementing policies affecting agricultural lands, which provided a useful background to the consideration of further actions the city might take. This chapter summarizes the background briefly, and then sets forth a description of the specific program the City of Modesto has committed itself to pursue in mitigation of the impacts on prime agricultural land resources posed by the expansion of the wastewater treatment plant.

Modesto's Historical Performance

Past Agricultural Land Absorption in Modesto. The very rapid growth of the 1970's - approximately 5 percent per year - was the subject of community discussion in Modesto before EPA's assistance in wastewater funding was sought. Concerns about the effects of growth spurred the city to monitor its expansion quantitatively which the city has done by tabulating and publishing data on land use change and by preparing a growth report annually for city government and public review.

City data suggest that new development in the 1970's has had less impact on prime agricultural land than earlier development had. This conclusion is based on the calculation of the coefficient of agricultural land conversion from land use survey data tabulated and published by the city in 1971 (reflecting conditions in 1970) and 1978 (reflecting conditions as of January 1, 1977).

The 1970 population of the area covered by the 1976 land use survey was 95,370. The developed area occupied by this population and associated urban land uses including roadways was 14,415 acres, the vast majority of which would have been prime land prior to its development. Since Modesto was first settled, then, about 0.15 acres of agriculturally-valuable land has been developed for each person added to the urban population.

During the period between the two land use surveys cited, the population of the 1976 survey area rose by 24,430 to 119,800. At the same time, agricultural land acreage in the land use survey area declined by about 3,000 acres. The coefficient of conversion during this period was therefore 0.12 acres per person. This represents a reduction of about 20 percent in the earlier rate of agricultural land conversion per unit of population growth.

However, that improvement would not suffice if (1) performance remained poor in an absolute sense, or (2) further measures could be taken to mitigate the impacts of growth on agricultural land resources. The next section views Modesto's performance as compared to that of other cities. Then the program Modesto has developed to further reduce the agricultural land impacts of growth is described.

Modesto's Performance Compared to Other Cities in California's Principal Agricultural Areas. Little comparative information on urban land use patterns is generally available, and less information on land use change at the urban periphery. In order to develop some comparative measures of performance on urban land use patterns from which sensitivity to agricultural land retention objectives could be inferred, Gruen Gruen + Associates sought information from the 15 largest cities in the valley and delta areas of the Sacramento and San Joaquin Rivers on density and land use patterns. This group of 15 cities includes all those in California's most important agricultural area with 1978 populations in excess of 25,000.

Three measures were used: gross urban density, gross residential density and availability of infill opportunities. Each of these constitutes an indirect measure of the efficiency of local land use patterns. The higher the density and the more contiguous the development, the less impact growth has had on agricultural lands. Table 5-11 summarizes the comparative density statistics and Table 5-12 summarizes the comparative infill data.

The statistics presented in Tables 5-11 and 5-12 show a wide variation among cities in California's agricultural areas with regard to existing land use patterns. An overall ranking representing all three measures is not possible due to inconsistencies among the measures (which suggest underlying differences among cities in definitions and tabulation methods). However, the data are sufficiently complete to show that Modesto has generally a respectable record, while such cities as Fairfield and Vacaville (both in Solano County) generally rank toward the bottom, and Davis and Woodland (both in Yolo County) rank near the top. From the fact that Modesto is not top ranked, it can be inferred that some margin of improvement remains attainable.

Table 5-11

COMPARATIVE DENSITY STATISTICS: FIFTEEN LARGEST CENTRAL VALLEY AND DELTA CITIES

		Land Area, Acres		Persons per Acre			
	Population	Total	Developed Residential	Total Acres	Rank	Residential Acres	Rank
Sacramento	261,500	60,282	18,000	4.34	9	14.5	4
Fresno	194,800	37,427	N.A.	5.20	6	N.A.	-
Stockton	127,300	25,966	7,008	4.90	7	18.2	3
Modesto	94,500	15,255	7,007	6.19	4	13.5	5
Bakersfield	86,100	36,143	4,488	2.38	13	19.2	2
Fairfield	54,400	32,256	8,843	1.69	15	6.2	11
Visalia	41,050	13,056	3,600	3.14	10	11.4	8
Redding	40,050	18,112	N.A.	2.21	14	N.A.	-
Vacaville	36,050	11,962	3,338	3.01	12	10.8	9
Davis	35,650	4,288	2,820	8.31	1	12.6	6
Lodi	32,930	5,082	3,750	6.48	2	8.8	10
Merced	32,800	7,542	5,436	4.35	8	6.0	12
Clovis	30,150	4,922	N.A.	6.13	5	N.A.	-
Woodland	26,950	4,217	2,230	6.39	3	12.1	7
Chico	25,250	8,040	1,230	3.14	11	20.5	1
Totals/ Averages	1,119,480	284,550	67,750	3.93		12.6	

N.A. = not available.

Source: Population estimates (1978) from California Department of Finance, Population Research Unit, Report 78 E-1 (Amended); acreage estimates from individual cities.

Table 5-12

COMPARATIVE INFILL DATA: FIFTEEN LARGEST CENTRAL VALLEY AND DELTA CITIES

	Total Acres	Vacant Developable Acres	% Vacant	Developed Residential Acres, Gross	Vacant Residential Acres	% Vacant	Composite Rank
Sacramento	60,288	14,500	24	18,000	N.A.	N.A.	8
Fresno	37,427	3,983	11	N.A.	N.A.	N.A.	3
Stockton	24,972	7,056	28	7,008	3,787	35	10
Modesto	15,255	2,265	15	7,007	1,831	21	6
Bakersfield	34,143	16,865	49	4,488	11,117	71	14
Fairfield	32,256	11,209	35	8,843	5,670	39	11
Visalia	12,480	1,200	10	3,600	600	14	4
Redding	17,920	9,000	50	N.A.	N.A.	N.A.	12
Vacaville	11,962	6,862	57	3,338	2,765	45	13
Davis	4,308	1,040	24	2,820	525	16	7
Lodi	5,083	463	9	3,750	74	2	1
Merced	7,542	N.A.	N.A.	5,436	491	8	2
Clovis	4,922	N.A.	N.A.	N.A.	N.A.	N.A.	-
Woodland	4,216	925	22	2,230	270	11	5
Chico	8,040	1,350	17	1,230	807	40	9
Total	280,814	--	--	--	--	--	
Averaging Base	268,350	76,718	--	49,750	27,937	--	
Average	--	--	29	77,687		36	

N.A. = not available

NOTE: Composite rankings are based on the sum of the percentage columns. Where data were not available (N.A.) for either one indicator or the other, the available datum was doubled for the composite ranking. The rankings should be regarded as highly approximate due to differences among cities in the reliability of data provided.

Sources: Cities listed

Evolution of Modesto's Mitigation Package

Mitigation a Grantee Responsibility. In evaluating applications for grants, EPA is required to take into consideration both the potential environmental impacts of the action supported by agency funds and the extent to which adverse impacts will be mitigated. The responsibility for selecting and implementing measures to reduce adverse impacts of the wastewater facility project described in Chapter 3 of this report rests with the City of Modesto as grantee agency. EPA's role is to determine whether the measures proposed by the grantee represent the maximum feasible mitigation.

Agricultural Land Retention Was Modesto Policy Before the Current Project Was Proposed. Modesto's location in the heart of a prime agricultural land belt, its past history as an agricultural service and marketing center, and the continuing importance of the food processing industry in the city are some of the reasons why local sentiment tends to favor city policies that reduce the effects of growth on prime agricultural lands.

Modesto has had in effect for several years (or longer) planning and development policies that recognize agricultural land retention as a city objective. Among these may be mentioned the *Urban Area General Plan*, the *Urban Growth Policy* and the *Stanislaus County General Plan* (to which the City of Modesto lent its support). The development process Modesto already has in effect applies to each newly-developing area the "neighborhood zoning and development prototype" which sets forth, in advance of consideration of specific development proposals, an overall neighborhood development program, including general locations of uses, scales of nonresidential uses and residential densities. Furthermore, the city has already implemented "planned development" (P-D) zoning in a manner which encourages infill in existing neighborhoods.

These measures have been reinforced by a number of other city actions and programs. In 1975 Modesto began an annual public review of its *Urban Growth Policy*, which involves a yearly staff report, coordinated city review of growth trends and policy, and opportunity for public input. The city also organized, in the winter of 1977-78, the Modesto Alternative Futures Symposium, a series of eight public meetings, each focusing on an aspect of the city's management, development policy or resources. The meetings were well-attended and were locally televised. Finally, the passage of Measure A (March 1979) requires an advisory vote by the electorate prior to a City Council decision on a trunk sewer extension.

The fact that all of these policies and planning tools are already in place helps explain why Modesto's land development pattern has improved in efficiency (via infill development and maintenance of contiguity in urban expansion) and has increased in density during the 1970's. In the absence of these measures, the impacts of growth on agricultural land absorption in recent years would have been considerably greater, and the forecast of the project's impacts on agricultural land absorption would be as much as 20 percent higher than the figures presented in Table 5-8 (p. 112).

EPA accepts these existing measures as partial mitigation of the adverse impact of community growth onto prime agricultural lands. It is the agency's view, however, that additional steps can be taken to reduce further the effects of Modesto's growth on prime agricultural lands, and the city has responded by proposing a series of additional measures, which are presented in the next section.

Modesto's package of mitigation measures builds on the city's past accomplishments and on extensive discussions and communications with EPA. The outcome of the city's deliberations was a commitment by the Modesto City Council (July 19, 1979) to pursue the measures listed in Table 5-13. In addition EPA has been assured by Modesto staff that measures already in effect will be continued. Both the new measures listed in Table 5-13 and key existing measures are included in the package described below, which is organized in three major sections: measures involving the regulation of land development; measures encompassing city policy and advance planning; and measures relating to intergovernmental coordination. This division may be useful to other cities devising programs to protect agricultural land resources.

Mitigation via Land Development Regulation

Zoning.

Reducing the Minimum Lot Size. A reduction in the minimum lot size in single-family zoning districts has the objective of reducing the amount of agricultural land absorbed by new single-family development. Modesto's reducing the minimum lot size from 6,000 to 5,000 square feet can reduce acreage requirements of single-family developments by as much as 16 percent. Other advantages include potential savings in the land costs associated with a new single-family house and an increase in the potential for infill development when implemented in combination with the next measure.

Table 5-13

MITIGATION OF THE ADVERSE EFFECTS OF THE MODESTO WASTEWATER FACILITIES EXPANSION ON PRIME AGRICULTURAL LAND: NEW MEASURES ACCEPTED BY MODESTO CITY COUNCIL

- Amend the *Urban Growth Policy* to contain a policy statement that all residential growth should be within the city.
- Amend the *Urban Growth Policy* to contain a goal of increasing the residential density of the city from 6.6 units per net acre (currently) to 7.0 units per net acre by 1985.
- Revise the *General Plan* to make the Santa Fe Railroad (rather than Bent Road) the eastern boundary of the urban reserve between Yosemite Boulevard and Dry Creek.
- Expand and clarify the priority list for trunk sewer extensions.
- Amend the zoning ordinance to make the R-1 Zone a density zone.
- Amend the zoning ordinance to reduce the minimum lot size in the R-1 and R-2 Zones from 6,000 to 5,000 square feet.
- Amend the zoning ordinance to specify a maximum lot size in the R-1 Zone.

Source: Unanimous vote of Modesto City Council, July 19, 1979.

Interpret the R-1 Zone as a Density Zone. Modesto's zoning ordinance has treated the R-1 Zone as composed of individual parcels, each of which carries entitlement for one single-family structure, irrespective of the size of the parcel. That means that even a parcel more than twice as large as the minimum lot size can accommodate only one housing unit. Modesto's amendment of the zoning ordinance to interpret the R-1 zone as a density zone would mean that parcels twice as big as the minimum lot size would be entitled to two (or more) housing units as long as other zoning requirements (such as for yards and access) are met.

This measure, when combined with the reduction in minimum lot size, increases infill opportunities in developed areas of the city. Under the minimum lot size of 6,000 square feet, a single-family parcel would have to be at least 12,000 square feet in size to accommodate a second unit. Under a minimum lot size of 5,000 square feet, a second unit could be accommodated on a single-family lot of only 10,000 square feet.

Establish a Maximum Lot Size. A maximum lot size puts a ceiling on the amount of land that can be encumbered by any one housing unit, thereby helping to reduce the amount of agricultural land converted to low density residential development. Of 1,850 subdivision lots recorded in Modesto in 1977, 145 (7.8 percent) contained over 10,000 square feet. The Modesto City Council committed itself to the maximum lot size concept, directing staff to indicate what the maximum would be. With less than 8 percent of all subdivision lots in the 10,000+ category, a 10,000 square foot limit appears acceptable.

Subdivision Controls.

Duplexes on Corner Lots in New Subdivisions. A measure implemented by Modesto in 1978 allows an increase in R-1 subdivision densities by permitting duplexes on corner lots. The overall increase in the number of units in a single-family subdivision resulting from this measure could be as high as 18 percent (because about 18 percent of all lots are corner lots). Duplexes are subject to special orientation and access requirements.

Use of P-D Zoning to Achieve Higher Densities. Modesto has implemented a P-D (Planned Development) overlay zone in order to (1) permit increased single-family density while (2) ensuring quality design, particularly with regard to privacy considerations. The P-D zoning has proven effective in increasing residential densities substantially over the minimum R-1 lot sizes: P-D densities can reach up to 10 units per net acre, while R-1 sites accommodate (at the old minimum lot size of 6,000 square feet) only about 7¼ units per net acre. This measure therefore can achieve a density increase of as much as 37 percent. Like other measures encouraging higher density, the effect of this measure is to reduce the amount of agricultural land absorbed by residential development.

Building Code.

Review Multi-family Construction Standards. The neighborhood prototype zoning (to be discussed further below) provides an opportunity for construction of multi-family units in R-3 districts, but Modesto's experience has been that, at certain times and in certain parts of the city, the buildout in R-3 zones has been at lower densities than the maximum (28 units/acre) permitted under the zoning ordinance. In connection with the EIS, Modesto staff agreed to review construction standards for multi-family residential structures to ensure that the standards are not so onerous as to discourage R-3 density development.

Mitigation via Land Development Policy and Planning

Urban Growth Policy Review.

Modesto first developed its *Urban Growth Policy* in 1974, and has conducted an annual review of that policy from 1975 on. Among existing and new mitigation measures which fit under the umbrella of this city activity are the following:

Monitoring Overall Urban Density. Modesto's overall urban density is monitored as one element of the annual growth review. In 1978, net residential density was 6.6 dwelling units per acre.

Establishing Urban Density Objectives. One of Modesto's new mitigation measures is to increase the residential density of the city from 6.6 units/net acre to 7.0 units/net acre by 1985.

Encourage Infill Development. It is Modesto city policy to encourage infill development. Some examples of city actions in furtherance of this policy include city annexation of enclaves and joint city/county action to upgrade services in the former county islands to city standards, thereby reducing the impediments to development of infill sites in those areas; and the decision to site any new subsidized housing outside of the west and south portions of the city, so as to reduce or avoid overconcentration of such units (a high concentration of subsidized units generally reduces the feasibility of market-rate housing in the same neighborhood because it affects the image of the neighborhood).

In another move to encourage infill, the 1979 urban growth policy review revised city policy so as to permit small residential annexations of sewered areas in unincorporated South Modesto. (Previously, such annexation was only considered if the area annexed was of sufficient size to support a branch fire station.) Over 500 acres of potentially developable land exists in this area. Since the policy change, one subdivision map (23.5 acres) has been filed.

Infill policies described thus far covers sites that are generally surrounded by development. Other sites lie at the fringe of Modesto's existing urban area, but within the short-term urban service area (described below). Development at these locations is encouraged by city policy requiring development to take place within city limits (first measure in Table 5-13) and within the current sewer service area.

Infrastructure Extension Policies.

Service Area Definitions. Modesto has delineated urban service areas, both short- (current sewer service area, or CSSA) and long-run (ultimate sewer service area, or USSA). This distinction makes clear which lands the city is committed to provide with urban services in the short-run, and it also makes clear which lands lie outside the city's long-run service area. The third mitigation measure in Table 5-13 - the change in the urban reserve boundary from Bent Road to the Santa Fe Railroad - in effect leaves the area between those roads out of the city's ultimate urban service area, thereby helping to ensure the long-run commitment of that land (comprising about 1,045 acres of prime farmland) to agricultural use.

Trunk Sewer Extension Priorities. Establishment of trunk sewer extension priorities offers an excellent approach to assuring that the direction of future urban growth will respect agricultural land retention objectives. In 1978, the Modesto City Council adopted an initial set of priorities for sewer trunk extensions. This list has been reconsidered and elaborated upon as a result of the environmental review of the wastewater project. The priority list [with further descriptions in brackets] is as follows:

1. Yosemite Trunk, Lincoln to Claus

2. Yosemite Trunk, Claus to Santa Fe Railroad

   [The Yosemite Trunk extension will serve a portion of eastern Modesto which the city considers an infill area. The absence from the priority list of any extension of this trunk beyond the Santa Fe Railroad reflects Modesto's decision not to provide sewer service to agricultural areas lying to the east of Empire within at least the next two decades.]

3. Sonoma Trunk, Floyd to Sylvan

4. Lakewood Trunk, Briggsmore to Floyd

5. Lakewood Trunk, Floyd to Sylvan

6. Sonoma Trunk, Sylvan to Claribel

7. Lakewood Trunk, Sylvan to Claribel

   [These five extensions will permit substantial urbanization of the northeast portion of Modesto. This area comprises that portion of Modesto's ultimate sewer service area which lies primarily on non-prime soils.]

8. Further extensions of the North Trunk and/or further development of the West Trunk

   [The areas served/potentially served by these trunks contain extensive agricultural acreages, much of which remains in fairly large holdings.]

The first seven trunk extensions on the priority list will accommodate all forecast development through the year 2000 and a significant amount of growth into the next century. Table 5-14 lists the neighborhoods served by the trunk extensions and their population capacities.

The selection of priorities reflects a number of important considerations in addition to agricultural land impacts of urban development. But the city also maintains that this list, by permitting infill on the east, by encouraging growth toward non-prime lands on the northeast, and by deferring to the long run action on trunk sewers serving the areas of Modesto that are presently most committed to agriculture, represents the city's intention to use infrastructure extension decisions in a manner that will help retain agricultural lands.

Prototype Neighborhood Concept. Modesto's *General Plan* implements planning on a neighborhood basis through use of the "prototype zoning and development plan". The prototype applies to an area of about three-quarters of a square mile divided into a grid of 40-acre cells by collector streets. The prototype provides for residential uses (with higher density zoning along the arterial streets at the perimeter of the grid) and for public facility and commercial support uses. There are roughly 480 acres in each new neighborhood available for development.

Table 5-14

GROWTH ACCOMMODATED BY PRIORITY SEWER TRUNK EXTENSIONS

Trunk Extension	Priority	Neighborhood Served	Gross Acres	Percent of Prime Agriculturial Land	Potential Net Residential Acres	Population Potentially Accommodated	Cumulative Total
Yosemite, Lincoln to Claus	1	Yosemite	728	100%	437	10,925	10,925
Yosemite, Claus to Santa Fe Railroad	2	Empire West	788	100	473	11,825	22,750
Sonoma, Floyd to Sylvan	3	Roselle	489	75	293	7,325	30,075
Lakewood, Briggsmore to Floyd	4	Merle	491	60	295	7,375	37,450
Lakewood, Floyd to Sylvan (betw. Lincoln & Claus)	5a	Claus	477	10	286	2,150	44,600
(betw. Claus & Santa Fe Railroad)	$5b_1$	Merle East	First 80% 234	10	140	3,500	48,100[1]
TOTAL BY YEAR 2000			*3,207*	*70%*[2]	*1,924*	*48,100*	*48,100*
	$5b_2$	Merle East	Remaining 20% 58	10	35	875	48,975
Sonoma, Sylvan to Claretina	6a	Mable	490	25	294	7,350	56,325
Claretina to Claribel	6b	Oakdale	492	25	295	7,375	63,700
Lakewood, Sylvan to Claretina	7a	Santa Fe	457	0	274	6,850	70,550
Claretina to Claribel	7b	Plainview	457	0	274	6,850	77,400
GRAND TOTAL	-	-	*5,161*	*48%*[2]	*3,096*	-	*77,400*

[1] New population by year 2000 as given in Table 5-7.

[2] Weighted average of preceding percentages in column.

Source: Gross acreages of neighborhoods from City of Modesto (Osner, pers. comm.); percent of prime agricultural land estimated approximately by referring to prime and nonprime soils map in Draft EIS; potential net residential acres estimated by GG+A as 60 percent of total gross acres based on review of neighborhood prototype; population capacity based on 25 persons/net residential acre from City of Modesto estimates (Osner, pers. comm.) for two other recent neighborhoods.

Allow for a Mix of Densities in Future Development. The neighborhood prototype assumes that newly-developing areas will contain a mix of densities. Of the total residential development in an "average" new neighborhood, 48 percent is earmarked for R-2 or R-3 development, with maximum densities of 14.5 and 28.0 units per acre, respectively. In addition to the provision for higher density zones, the entire R-1 zone in the prototype carries a P-D overlay, so that actual densities can be considerably higher than standard R-1 zoning if the subdividers choose that route.

If developed to the maximum permitted, overall densities under the prototype would be 9 units/gross acre as compared with 4.8 units/gross acre, the density figure (reflecting historic preferences in Modesto) used in the land absorption forecast of this EIS. The neighborhood prototype approach both permits and facilitates higher densities than Modesto's historic pattern.

Target Neighborhood Densities. The prototype allows higher densities, but does not mandate them. A developer who is proposing a subdivision in an R-2 or R-3 zone can propose R-1 densities, and, in the past, the city has approved many subdivisions with densities well below the maximum permitted. In order to help assure that opportunities for higher densities are not foregone in this manner, Modesto staff will, for all future neighborhoods, establish a density goal based on both the prototype and the land ownership pattern in newly developing areas.

Monitoring the Density of New Development. Modesto will monitor the density levels of new neighborhoods as they develop as part of the annual review of the *Urban Growth Policy*. This monitoring will help to guide development approvals in a manner consistent with the city's objective of increasing overall density to 7.0 units per net acre by 1985.

Mitigation Via Intergovernmental Cooperation

A number of the important actions taken in the Modesto area to help reduce agriculture's loss of land to urban uses have resulted from actions by Stanislaus County and its agencies, such as the Local Agency Formation Commission (LAFCO), typically with support of or in partnership with the City of Modesto. Such joint efforts offer a valuable model to other localities, recognizing that protection of agricultural lands requires coordination and cooperation among all local agencies with land planning responsibilities. Because these measures are not implementable directly by the City of Modesto, they are presented only briefly here.

Urbanization Requires Annexation. Stanislaus County removed itself from the "subdivision business" about five years ago. All urban development in the county must be contiguous to existing urban areas. In the Modesto area, urban development can be accomplished only by annexation. The county policy is implemented by LAFCO and reinforced by Modesto's own policy (the first measure in Table 5-13) that all residential growth should be within the city limits.

Rural Development Controls.

Minimum Lot Size in Agricultural Areas. Stanislaus County has a minimum lot size of 10 acres in prime agricultural areas in order to deter residential development unrelated to agriculture. An increase in this minimum is currently under study.

Rural Residential Development Limited to Non-prime Areas. There is a market for rural residential development (5- to 20-acre rural lots) in Stanislaus. County policy is to restrict such development to locations where similar development already exists (some such development predates current county agricultural retention policies) and to locations on non-prime soils.

Limit Nonresidential Development in Unincorporated Areas. Stanislaus County policy restricts use of agricultural locations by nonagricultural uses, commercial as well as residential. Commercial uses proposed for sites in agricultural areas must demonstrate a direct supportive role toward neighboring agriculture. The county is currently reviewing its policy with regard to nonresidential uses unrelated to agriculture, such as tourist attractions and tourist service facilities, which can often generate pressures for residential development in rural areas.

Implementation of the Williamson Act. The operation of the Williamson Act was discussed in the mitigations inventory, p. 160. In Stanislaus County, Modesto and the county have developed a coordinated policy with respect to Williamson Act contracts: the City of Modesto formally supports contracts outside the city's long-term expansion area (the ultimate sewer service area) and formally opposes contracts within the area. The city's opposition does not prevent the county and the landowner from signing a contract. Its effect is rather to relieve the landowner of penalty liability if the contract is broken, which facilitates development of lands lying in the path of urban expansion.

Limiting Parcel Division in Rural Areas. Stanislaus County permits lot splits in agricultural zoning districts only upon a finding by the Board of Supervisors that the proposed split will serve an agricultural purpose. The county's 1979 rezoning to agriculture of substantial acreages around Modesto, Oakdale and Riverbank formerly classified as rural residential increases the impact of this measure.

Agricultural Element of County General Plan. Stanislaus County established an agricultural study group in 1978 to review agricultural land issues and make recommendations to the Board of Supervisors on such matters as minimum lot size in agricultural zoning districts and the preparation of an agricultural element of the general plan. Modesto has offered staff support in the development of a county agricultural element.

Implementation and Effectiveness of Mitigation Measures

As noted earlier, mitigation measures are effective only when they reduce the adverse impact of a project below what it would have been in the absence of any measures.

There is little doubt that Modesto's mitigation program as outlined in this chapter will reduce the urban demand for agricultural lands. The reduction will be accomplished by a mix of complementary and overlapping strategies which (1) encourage infill, thereby increasing densities of currently developed areas; (2) increase the density of newly-developing areas; and (3) reduce urban pressures on agricultural lands both generally (by reducing the amount of agricultural land needed to accommodate a given level of urban growth) and in specific fringe areas of the city.

Quantifying the impacts of these measures is a difficult task for many reasons. Because certain measures overlap, the advantages of one preclude the advantages of the overlapping measure. For example, where P-D zoning is used in place of R-1 zoning, measures available to increase density in R-1 districts are foregone in favor of the density increases permitted by P-D. Because of such overlapping, the density gains estimated for various measures are not additive.

Another complication in estimating the impacts of mitigation measures is the fact that developers will continue to enjoy some flexibility within Modesto's planning and development controls with regard to housing type and density. This flexibility is desirable because it helps to assure that Modesto housing will be able to satisfy most consumer preferences, thereby minimizing spillover development to other areas. But it also means that the actual land absorption of new development cannot be predicted with a high degree of accuracy - an order-of-magnitude estimate is the best measure of impact possible.

Finally, in some cases not enough information is available to estimate impacts quantitatively. For example, the number of oversize R-1 lots is not known. In other cases, assumptions as to how certain measures will be implemented remain to be verified. For example, a maximum lot size of 10,000 square feet has been assumed, but the final determination has not yet been made by the city.

Table 5-15 provides a summary of the main elements of the city's mitigation program, including estimates of the potential impact of individual measures wherever estimates were possible, and the status of implementation.

The immediate effect of the new mitigation package will probably lie in the vicinity of a five percent decrease in agricultural land absorption below what it would have been in 1985 without the new measures. This estimate is based on Modesto's commitment to achieve an increase in overall city residential density of six percent between 1979 and 1985. The various measures set forth in Table 5-15 appear to offer sufficient opportunity for increased residential density to make that six percent improvement realistic and probably somewhat conservative. On the other hand, the density gains in residential land use are unlikely to be matched by comparable gains in other uses - industrial, commercial, and public - which are less amenable to density reduction.

The five percent reduction applies to the period ending in 1985. Beyond that year, assuming the same measures are in effect, an additional five percent reduction during the 1985 to 1990 period appears to be a reasonable expectation. Beyond that point, the reduction is assumed to stabilize as most vacant infill sites will have been developed, and further infill could be accomplished only through redevelopment. On a rough basis, over the period of time during which the full wastewater project attains capacity, a reduction of 10 percent in agricultural land absorption is a defensible estimate of the overall impact of the mitigation package developed by Modesto in response to the Draft EIS. This impact builds upon and extends the 20 percent reduction in agricultural land absorption that prior measures in the 1970's have already accomplished.

Table 5-15

MODESTO'S AGRICULTURAL LAND MITIGATION PROGRAM: IMPACT SUMMARY AND TIMETABLE FOR IMPLEMENTATION

New (July 1979) Measures	Effect on Amount of Land Needed	Effect on Location of Land Needed	Implementation Status: ● Adopted ○ Under Consideration
■ Amend *Urban Growth Policy* to contain a policy statement that all residential growth should be within the city.	Negligible.	Enforces contiguity, reducing pressure for agricultural land conversion.	● Considered and approved by Modesto City Council, August 7, 1979.
■ Amend *Urban Growth Policy* to contain a goal of increasing city residential density to 7.0 units/net acre by 1985.	An increase from 6.6 to 7.0 du/net acre reduces land requirements by about 6 percent.	None.	● Considered and approved by Modesto City Council, August 7, 1979.
■ Revise *General Plan* to reduce extent of the urban reserve area on the east.	None.	Preserves approximately 1,045 acres of prime agricultural lands east of the Santa Fe Railroad for at least the next two decades.	○ Amendment and EIR to be prepared by February 1980; Planning Commission action anticipated April 1980; Council action, May 1980.
■ Expand and clarify priority list for trunk sewer extensions.	Negligible.	Channels growth toward and on non-prime soils; allows for development of 1,018 acres by year 2000 on non-prime soils that might otherwise have absorbed prime soils.	● Considered and approved by Modesto City Council, August 7, 1979.
■ Amend Zoning Ordinance to make the R-1 Zone a density zone.	Permits additional development on oversize lots in previously-developed R-1 Zones.[1]	Encourages infill; reduces urban demand for agricultural lands.	○ Amendment has been drafted; Planning Commission action anticipated January 1980; Council action, February 1980.

Table 5-15, continued

New (July 1979) Measures	Effect on Amount of Land Needed	Effect on Location of Land Needed	Implementation Status: ● Adopted ○ Under Consideration
■ Amend Zoning Ordinance to reduce the minimum lot size in R-1 and R-2 Zones to 5,000 square feet.	Change from 6,000 to 5,000 square feet allows a maximum reduction in land requirements of 16 percent.	Reduces urban demand for agricultural lands.	○ Amendment has been drafted Planning Commission action anticipated January 1980; Council action, February 1980.
■ Amend Zoning Ordinance to add a maximum lot size to the R-1 Zone.	Maximum lot size of 10,000 square feet could reduce single-family subdivision land requirements by 5 percent.[2]	Reduces urban demand for agricultural lands.	○ Same.
Other Recent (1978-79) Measures			
■ Duplexes on corner lots in new subdivisions.	If fully realized, would reduce by 18 percent the land requirements of new single-family subdivisions.	Reduces urban demand for agricultural lands.	● In effect.
■ Permit small annexations in South Modesto; annex county enclaves; reduce concentration of subsidized housing.	None.	Encourages infill; reduces urban demand for agricultural lands.	● In effect.
Major Prior (1977 and Earlier) Measures			
■ P-D Zoning	If fully realized, could reduce land that would otherwise be absorbed by R-1 development by 37 percent.[3]	Encourages infill (especially by higher-density single-family structures) and reduces land requirements of new subdivisions.	● In effect.
■ Neighborhood prototype	At 75 percent buildout, allows for 38 percent higher density than 1976 levels.[4]	Reduces urban demand for agricultural lands.	● In effect.

[1] Impact cannot be quantified because the number of oversize lots is not known.

[2] Estimate based on 1977 subdivision data, assuming that lots in excess of 10,000 square feet average 15,000 square feet in area.

[3] Maximum R-1 density is 7¼ units/acre compared to 10 units/acre under P-D zoning, resulting in a potential decrease of 37 percent in land absorption.

[4] At a buildout of 75 percent of maximum allowable density, the prototype yields 6.825 units/gross acre compared to the 1976 city average of 4.95.

Source: Modesto Planning and Community Development Department and Gruen Gruen + Associates.

In addition to gains in agricultural retention resulting from revisions in residential development regulations, gains will also be realized via infrastructure extension policies which give weight to soils type in determining the priority areas for urban expansion. Approximately 960 acres of non-prime soils will be developed by 2000 (and 1,700 thereafter); these lands will be developed in lieu of converting prime agricultural land to urban use.

In Table 5-16 are summarized the agricultural land retention results of complementary Modesto policies concerning urban development and infrastructure extension. The table presents total urban land needs, residential land needs, and prime agricultural land conversion under three conditions: unmitigated (i.e., a return to pre-1970 development patterns), partially mitigated (reflecting the programs put in effect by Modesto and Stanislaus County prior to the publication of the Draft EIS) and mitigated via new land development regulations proposed as a response to the Draft EIS.

These first three sets of estimates indicate that most urban land needs would be met via agricultural land conversion in the absence of the infrastructure extension priorities recently established. The mitigation measures of greatest immediate importance are those relating to land development regulations. However, the infrastructure extension priority system begins to emerge as extremely important once the Sonoma and Lakewood trunks are extended beyond Floyd into the northeast area which contains the major areas of non-prime land in Modesto's ultimate sewer service area. Once the Lakewood trunk is extended beyond Floyd (priority 5 as listed in Table 5-14), the prime agricultural land absorbed by residential growth will drop from about 87 percent (of major residential land needs) to about 12 percent.

This retention effect would be achieved sooner but for the Yosemite trunk extension; the area served by that facility is totally prime. However, there are other compelling reasons to proceed with the Yosemite extension, which will permit development of one of Modesto's largest infill areas. The area to be developed once the Yosemite trunk is extended is currently encompassed by development on three sides. Furthermore, this area, of the potential residential expansion areas available, is closest to major employment centers both downtown and in the Beard industrial tract. From the perspective of overall efficiency in the land use pattern, including consideration of commute distances and related air quality impacts, the Yosemite extension can legitimately be given priority even though it will serve development on prime agricultural land.

Table 5-16

PRIME AGRICULTURAL ACREAGE RETAINED UNDER MODESTO'S MITIGATION PROGRAM

	1984 (Capacity of Initial Project)	1995 (Capacity of Full Project)	2000
Urban Land Needs			
Unmitigated[1]	1,370	5,770	8,050
Partly Mitigated (Existing Condition)[2]	1,095	4,615	6,440
With New Land Development Regulations[3]	1,065	4,295	5,980
Residential Land Needs			
Unmitigated[1]	870	4,010	5,700
Partly Mitigated (Existing Condition)[2]	695	3,210	4,560
With New Land Development Regulations[4]	665	2,890	4,100
Prime Agricultural Land Conversion			
Unmitigated[1]	1,025	4,480	6,650
Partly Mitigated (Existing Condition)[5]	820	3,585	5,320
With New Land Development Regulations[6]	790	3,275	4,860
Prime Agricultural Land Retained via Total Mitigation Program:			
Retention via New Land Development Regulations[7]	235	1,205	1,790
Retention via New Infrastructure Extension Priorities[8]	0	55	1,020
Total Acres Retained	235	1,260	2,810
Acres of Prime Agricultural Land Retained as Percent of Prime Agricultural Land Conversion in Unmitigated Condition	23%	28%	42%

[1] As discussed in the text, measures adopted in the 1970's have reduced agricultural land absorption by about 20 percent from what it would otherwise have been. Thus, acreage estimates for the unmitigated condition are those figures which, reduced by 20 percent, yield the estimate given for the partially mitigated condition.

[2] The EIS forecast, as presented in Table 5-7, p. 25.

[3] Total acres required in partly mitigated condition (preceding row) minus change in residential acres required between partially mitigated condition and condition with new land development regulations.

[4] Residential land requirements under partial mitigation (preceding row) have been reduced by 1 percent for each elapsed year to 1990. That is, in 1981, required residential acres under new regulations are 1 percent less than under partial mitigation; in 1982, 2 percent less, and so forth. After 1990, a 10 percent reduction is maintained.

[5] The EIS forecast, as presented in Table 5-8, p. 26.

[6] Deducts difference in residential land needs from agricultural land conversion in the partly mitigated condition.

[7] Agricultural land absorption in the unmitigated condition minus agricultural land absorption under new development regulations.

[8] Calculated from data presented in Table 5-14, p. 97.

Source: Gruen Gruen + Associates

Adequacy of Mitigation Measures

The growth forecast in this EIS - almost 50,000 new residents by the year 2000 - would absorb 6,650 acres of prime agricultural land by the year 2000 if unmitigated. Measures implemented by the City of Modesto prior to summer 1979 and further measures developed by the city after the publication of the Draft EIS provide for a significant reduction in the amount of agricultural land required by urban uses. The measures predating June 1979 have been shown in this chapter (p. 174) to have reduced agricultural land conversion by about 20 percent from the levels of the 1960's. The added measures responding to the EIS will accomplish a further reduction rising to 42 percent by the year 2000.

Based on these findings, the Regional Administrator concludes that agricultural land impacts are adequately mitigated and that, from the point of view of agricultural land impacts, the Step 2 grant may be issued.

Because some measures will not be formally in effect for several months due to procedural requirements of local and state statutes which must be adhered to, EPA cannot yet make a commitment with regard to the Step 3 grant. The Step 2 grant will be conditioned such that, upon the completion of Step 2, the City of Modesto will provide EPA with a status report on the implementation of agricultural mitigation measures approved by EPA. The agency will then review the record to assure that mitigation has been implemented to the maximum extent possible prior to issuance of the Step 3 grant.

National Impact of Comparable Actions by Other Cities

If the kinds of measures implemented and envisioned by Modesto to reduce the conversion of agricultural land stemming from urban growth were adopted in other jurisdictions in prime farmland areas, the national impact over the next two decades would be substantial.

At the beginning of this chapter, it was stated that losses of prime agricultural land to urban and water uses were about 7.4 million acres during the eight-year period 1967 to 1975. If conversion to urban use was three-fourths of that, the rate of urban conversion would be about 700,000 acres per year. Projected through the end of the century, this trend would result in the urbanization of 14,000,000 acres of prime agricultural land.

Programs like Modesto's - including both the mitigation measures adopted prior to the Draft EIS and those developed subsequently - can reduce this conversion. For example, a 40 percent reduction in conversion of agricultural land to urban use would retain 5,600,000 acres of that land in agriculture. While the actual number of acres retained from one jurisdiction to another may seem insignificant viewed in isolation, the cumulative effects are substantial, arguing that no community with prime agricultural land resources should ignore agricultural land retention issues in its planning, development and infrastructure extension decisions.

Chapter 6

AIR QUALITY IMPACTS OF URBANIZATION

Existing Air Quality Problems

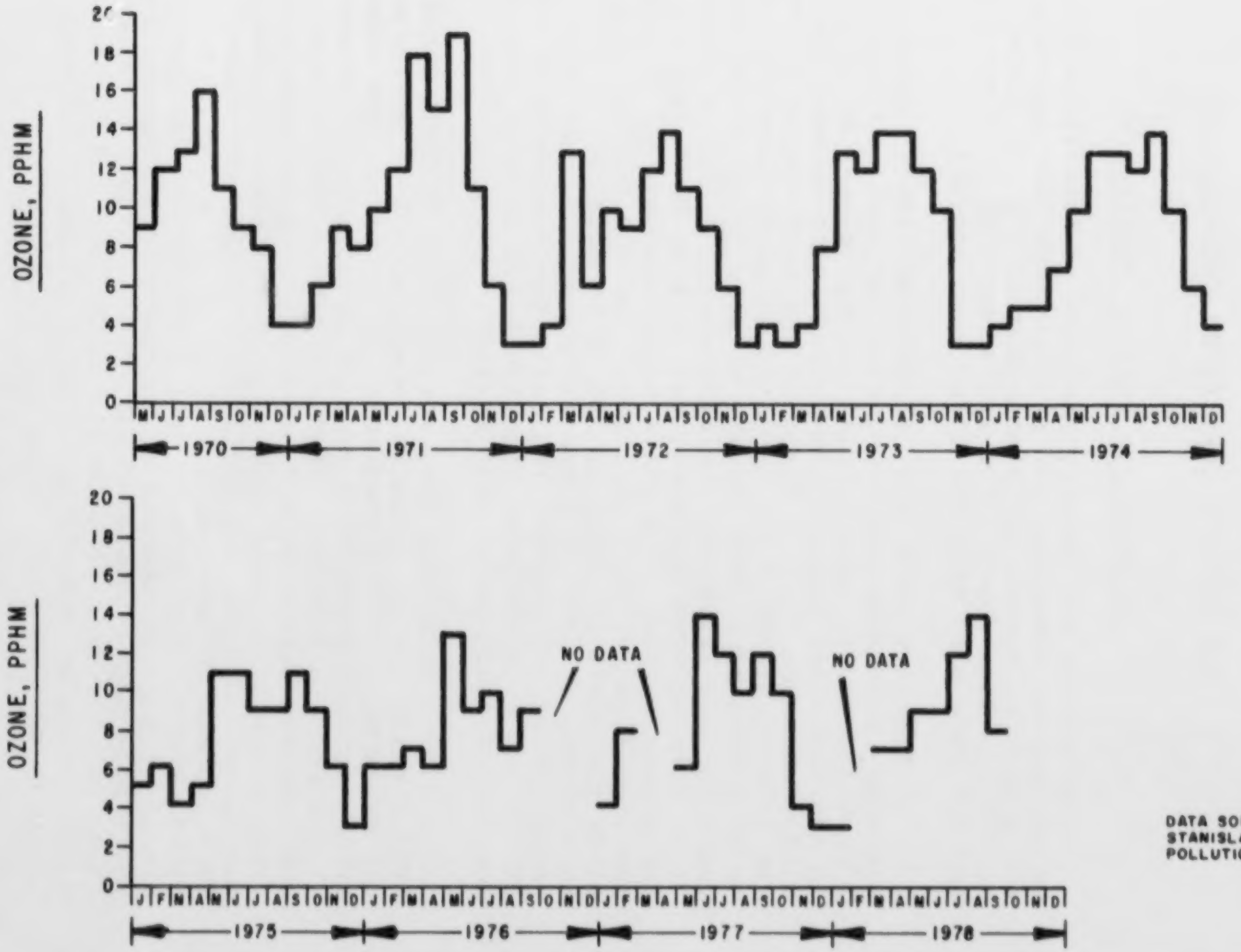
Recognized air quality problems in Stanislaus County involve ozone, carbon monoxide, and particulates (see Appendix I for a general background discussion of air pollution). Ozone monitoring data for Modesto are summarized in Figures 6-1 and 6-2 (see also Appendix K for more detail).

In February 1979, EPA changed the federal primary and secondary standards for ozone from the previous level of 8 pphm (parts per hundred million, by volume) to 12 pphm. In addition, EPA changed the procedure to be used for determining when the federal standard has been violated. Previously, the federal standard was violated if ozone levels of 9 pphm or more were monitored for two or more hours during any year. Under the new standard, violations will occur if hourly ozone levels of 13 pphm or more are monitored on 4 or more days during any 3-year period. The state ozone standard of 10 pphm is now significantly more stringent than the federal standard, since the state standard is not to be equalled or exceeded. This change in federal ozone standards occurred after Figure 6-2 was prepared. Table 6-1 indicates the frequency of violation of the new federal ozone standard based on data from the downtown Modesto monitoring station.

Ozone levels have been monitored in Turlock since April 1977. While trends in ozone levels cannot be evaluated from the brief data record available, it is clear that ozone levels at the Turlock monitoring station significantly exceed those at the Modesto station. This would be a logical result of the expected "urban plume" of emissions from Modesto, since ozone accumulates only after a complex series of chemical reactions. Special monitoring done during the summer of 1978 appears to complicate such an explanation of Turlock's ozone levels. Preliminary data from monitoring instruments placed at Salida, Oakdale and Hughson show numerous instances where peak ozone levels at Salida and Oakdale were equal to or greater than peak levels at Turlock and Hughson. Peak ozone levels at Modesto were almost always the lowest of the five stations.

FIGURE 6-1

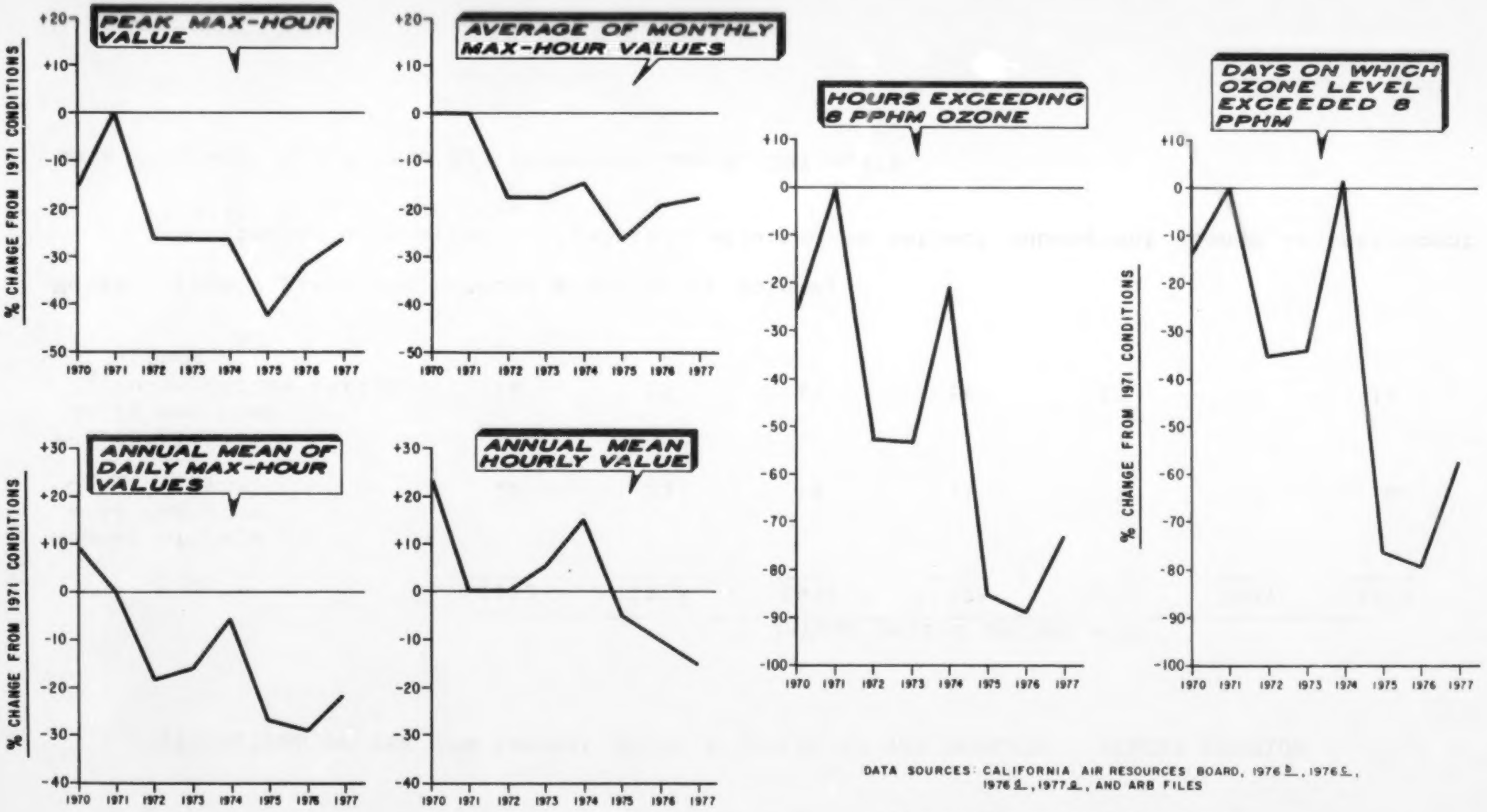
TRENDS IN MONTHLY PEAK OZONE LEVELS, MODESTO 'J' STREET STATION



DATA SOURCES: TABLE K-1 &
STANISLAUS COUNTY AIR
POLLUTION CONTROL DISTRICT

FIGURE 6-2

TRENDS IN AIR QUALITY PARAMETERS FOR OZONE AT THE MODESTO 'J' STREET STATION



DATA SOURCES: CALIFORNIA AIR RESOURCES BOARD, 1976b, 1976c, 1976d, 1977a, AND ARB FILES

NOTE: 1971 WAS FIRST COMPLETE YEAR OF MONITORING

Table 6-1

VIOLATIONS OF THE NEW FEDERAL OZONE STANDARD AT THE MODESTO J STREET STATION

	3-Year period ending with						
	1972	1973	1974	1975	1976	1977	1978
Number of Days with Max-Hour $O_3 \geq 13$ pphm	22	23	14	11	7	2	6
Fourth highest daily max-hour O_3 value during period (pphm)	16	15	14	14	13	12	14

Notes: pphm = parts per hundred million, by volume.

Monitoring data prior to June 1975 adjusted to reflect subsequent change in instrument calibration procedures.

Data Sources: California Air Resources Board, 1970-1978.

It is possible that Salida and Oakdale are influenced by Stockton's urban plume while Turlock and Hughson are influenced by Modesto's urban plume. But a detailed analysis of hourly wind and ozone data (and perhaps additional monitoring) would be necessary to substantiate such an explanation.

The Modesto station is the only one in Stanislaus County which monitors carbon monoxide levels. While peak 1-hour levels seem to have increased somewhat since the early 1970s, peak 8-hour levels have remained nearly constant (Table 6-2). The federal 8-hour standard of 9 ppm (parts per million) is violated on a few days each year, generally during November or December.

Federal and state standards for suspended particulates (for both annual and 24-hour periods) are regularly exceeded at all monitoring stations in the county. No clear trend of increasing or decreasing levels can be detected from the available data record (Table 6-2).

Current Air Quality Management Programs

Federal and state activities related to air quality have been authorized by several pieces of legislation, the most important of which are the 1970 and 1977 amendments to the Clean Air Act. The 1970 Clean Air Act amendments set the basic structure for federal and state air pollution control programs. This basic structure has been retained under the 1977 Clean Air Act amendments.

The 1970 Clean Air Act amendments required each state to develop and adopt a plan (implementation plan) to achieve, maintain and enforce the national primary and secondary ambient air quality standards in all portions of the state. The 1970 amendments further required that these implementation plans provide the means for achieving and maintaining all national primary standards by July 1975 and all national secondary standards "within a reasonable time". EPA was granted the authority to approve or disapprove these plans, and to promulgate an acceptable plan if all or a portion of the submitted plan was disapproved. EPA was also given the authority to grant time extensions of up to 2 years for the attainment of a national primary ambient air quality standard in any particular air quality control region.

The 1977 Clean Air Act amendments recognized the fact that most of the major urban regions of the country failed to attain the national primary air quality standards within the deadlines set by the 1970 Clean Air Act amendments. The new amendments required the states and EPA to identify areas which meet all federal air quality standards; areas which

Table 6-2

SUMMARY OF CARBON MONOXIDE AND PARTICULATE MONITORING IN STANISLAUS COUNTY

Pollutant	Station	Parameter		1971	1972	1973	1974	1975	1976	1977
Carbon monoxide	Modesto - J Street	Max. Hour Value (ppm)		19	17	17	18	23	25	22
		Peak 8-Hour Average (ppm)		NA	10	11	11	12	11.5	11.9
		Periods Exceeding 8-Hour Standard of 9 ppm	Days	8	4	6	2	6	1	1
			Hours	130	21	33	8	31	13	13
Suspended particulates	Modesto - J Street	Peak 24-Hour Value (µg/m^3)		382	196	228	199	211	255	301
		Annual Geometric Mean (µg/m^3)		91.0	94.8	99.3	107.8	97.6	106.3	101.1
		Number (%) of Samples > 100 µg/m^3		28 (38.9%)	11 (40.7%)	24 (57.1%)	35 (63.6%)	29 (49.2%)	34 (55.7%)	31 (51.7%
		Number (%) of Samples ≥ 150 µg/m^3		8 (11.1%)	5 (18.5%)	8 (19.0%)	10 (18.2%)	6 (10.2%)	19 (31.1%)	8 (13.3%
	Modesto - Oakdale	Peak 24-Hour Value (µg/m^3)		-	-	-	188	152	234	195
		Annual Geometric Mean (µg/m^3)		-	-	-	92.2	65.4	81.3	79.1
		Number (%) of Samples > 100 µg/m^3		-	-	-	8 (42.1%)	6 (13.6%)	22 (39.3%)	18 (31.6%
		Number (%) of Samples ≥ 150 µg/m^3		-	-	-	1 (5.3%)	1 (2.3%)	9 (16.1%)	3 (5.3%
	Salida	Peak 24-Hour Value (µg/m^3)		-	-	-	204	147	196	183
		Annual Geometric Mean (µg/m^3)		-	-	-	61.6	73.0	76.5	67.6
		Number (%) of Samples ≥ 100 µg/m^3		-	-	-	7 (20.6%)	9 (19.6%)	19 (33.9%)	9 (29.0%
		Number (%) of Samples ≥ 150 µg/m^3		-	-	-	1 (2.9%)	0 (0 %)	4 (7.1%)	2 (6.5%
	Patterson	Peak 24-Hour Value (µg/m^3)		-	-	-	169	206	206	141
		Annual Geometric Mean (µg/m^3)		-	-	-	75.2	73.7	78.5	60.9
		Number (%) of Samples ≥ 100 µg/m^3		-	-	-	9 (18.8%)	19 (34.5%)	16 (36.4%)	5 (25.0%
		Number (%) of Samples ≥ 150 µg/m^3		-	-	-	2 (4.2%)	2 (3.6%)	3 (6.8%)	0 (0 %
	Turlock	Peak 24-Hour Value (µg/m^3)		-	-	-	162	157	217	156
		Annual Geometric Mean (µg/m^3)		-	-	-	78.9	80.7	89.5	72.2
		Number (%) of Samples ≥ 100 µg/m^3		-	-	-	12 (23.5%)	18 (33.3%)	22 (41.5%)	12 (34.3%
		Number (%) of Samples ≥ 150 µg/m^3		-	-	-	3 (5.9%)	1 (1.9%)	8 (15.1%)	1 (2.9%

Notes:

ppm = parts per million by volume
µg/m^3 = micrograms per cubic meter

Federal primary standards for suspended particulates are 260 µg/m^3 on a 24-hour basis and 75 µg/m^3 on an annual geometric mean basis.
Federal secondary standards for suspended particulates are 150 µg/m^3 on a 24-hour basis and 60 µg/m^3 on an annual geometric mean basis.
State air quality standards for suspended particulates are 100 µg/m^3 on a 24-hour basis and 60 µg/m^3 on an annual geometric mean basis.

SOURCES: California Air Resources Board, 1970-1978; 1974a; 1974b; 1977a.

exceed any of the federal standards; and areas where adequate ambient air quality monitoring data are lacking. Stanislaus County has been designated a "nonattainment area" with respect to ozone, particulates, and carbon monoxide and an "unclassifiable area" (areas where data are nonexistent or insufficient to determine attainment or nonattainment status) for sulfur dioxide.

The 1977 Clean Air Act amendments contain several provisions regarding federal permit activities or financial assistance programs. These provisions can be summarized as follows:

- After July 1, 1979 EPA is prohibited from awarding any grants authorized under the Clean Air Act, except for air quality improvement or maintenance purposes, if the agency applying for the grant is in an air quality control region where the following three conditions apply: one or more federal primary standards have not been attained; transportation control measures are necessary to achieve the standard being violated; and an appropriate state implementation plan has not been submitted (or reasonable efforts toward developing such a plan are not being made). This funding prohibition also applies if an approved plan is not being implemented.

- After July 1, 1979 the U. S. Department of Transportation is prohibited from awarding grants or approving projects under Title 23, United States Code, except for safety, mass transit, or transportation projects which improve air quality, if the agency applying for the grant funds or project approval is in an air quality control region where the three conditions cited above apply. This funding prohibition also applies if an approved plan is not being implemented.

- No federal agency can engage in, license, permit, approve, or support in any way any activity which does not conform to the approved or promulgated state implementation plan for the relevant area.

- EPA is authorized to withhold, condition, or restrict any grant for construction of sewage treatment facilities if it is determined that: (a) such sewage treatment facilities will not comply with Clean Air Act provisions relating to new source performance standards or emission standards for hazardous air pollutants; (b) the state does not have, or is not implementing, an approved state implementation plan which expressly quantifies and provides necessary management programs to deal with the air pollutant emissions which may reasonably be anticipated to result directly or indirectly from the new sewage treatment capacity to be created by such construction; (c) the construction of such treatment works would create new sewage treatment capacity which may reasonably be anticipated to cause or contribute to, directly or indirectly, a larger increase in pollutant emissions than has been provided for under the applicable state implementation plan; or (d) the construction of such treatment works would create new sewage treatment capacity which would cause or contribute to, directly or indirectly, an increase in pollutant emissions which will interfere with or be inconsistent with the applicable implementation plan of any other state.

Nonattainment Planning in Stanislaus County

The 1977 Clean Air Act amendments indicate that implementation plan provisions for ozone and carbon monoxide nonattainment areas should be prepared by an appropriate organization of local government officials, as designated by the state. The California Air Resources Board (ARB) has designated the SAAG Air Quality Task Force as lead agency for development ozone and carbon monoxide control strategies for the county; ARB will be responsible for the development of particulate controls (Steel, pers. comm.). A recommended set of stationary source controls and transportation-related measures (SAAG, 1978b), has recently been adopted by city and county governments and submitted to ARB for consideration in the state implementation plan revisions required by the Clean Air Act. Table 6-3 summarizes the tactics being recommended by that document.

Report IV of the SAAG nonattainment plan (SAAG, 1978b) initially projected that the measures identified in Table 6-3 would allow attainment of the 8 pphm federal ozone standard prior to 1987. An October 1978 addendum to that report revised this assessment to indicate probable violations of the 8 pphm standard until about 1994. With the recent change in federal ozone standards, SAAG now estimates that the measures in Table 6-3 will provide attainment of the 12 pphm federal ozone standard by 1984 (Steel, pers. comm.).

As noted in Table 6-2, peak 8-hour average carbon monoxide levels have exceeded 9 ppm federal standard since monitoring began at the Modesto J Street station. The federal standard is phrased as a level "not to be exceeded more than once per year". EPA and ARB both determine the second-highest 8-hour average based on a time period distinct from that used to determine the highest 8-hour average (Owen, pers. comm.; Dolislager, pers. comm.). On this basis, violations of the federal 8-hour carbon monoxide standard occurred in 1975 and 1978, but not in 1976 or 1977. SAAG projects attainment of the federal 8-hour carbon monoxide standard by 1980, with maintenance of the standard through 1995.

Table 6-3

TACTICS RECOMMENDED BY SAAG AIR QUALITY MAINTENANCE PLAN

	Implementation Responsibilities							Reliance on Tactic: % of Projected Total Reduction In Organic Emissions By				
Tactic	EPA	ARB	Cal-Trans.	Cities and County	County Ag. Commissioner	APCD	Private Actions	1982	1985	1987	1990	1995
New Source Review Procedures						X		?	?	?	?	?
Vehicle Inspection/ Maintenance Program		X						51.98	28.46	25.44	24.33	24.98
Traffic Flow Improvement				X				8.50	4.03	3.18	2.50	2.31
Reduction in Volatile Organics in Surface Coatings		X						7.11	18.39	19.19	21.37	24.58
92 percent Vapor Recovery at Gas Stations						X		24.51	17.58	14.69	13.14	12.45
Ban on most Weed Oil Use					X			0	24.30	30.92	31.27	27.93
Improved Public Transit				X				0.59	0.54	0.44	0.37	0.16
Bike Lanes and Storage Facilities				X			X	?	?	?	?	?
Areawide Carpool Programs				X				0.59	0.54	0.44	0.37	0.16
Retrofit Controls on Heavy Duty Gasoline Vehicles		X						0.99	2.68	1.75	0.46	0.40
Staggered/Flexible Work Hours				X			X	?	?	?	?	?
Development of Alternative Vehicle Fuels	X	X	X	X				0.40	0.67	0.55	0.46	0.40
Employer Programs to Encourage Car Pools, Transit, Bike Use, etc.							X	?	?	?	?	?
Source closings, pesticide reformulations, etc.							X	3.36	2.68	2.30	4.81	5.83

SOURCE: SAAG, 1978b.

On March 22, 1979 the SAAG nonattainment plan was revised and adopted by ARB Resolution 79-13. Some of the more significant ARB revisions included:

- Revision of the SAAG emission inventory to account for emissions from cutback asphalt and metal parts source categories.
- Replacement of the SAAG analysis of allowable emissions with one prepared by ARB staff. The ARB staff analysis was based on a computer simulation model which indicated a 41 percent reduction in reactive organics would be necessary to meet the new federal ozone standard.
- Deletion of the SAAG estimates of emission reductions for carpool, transit, and traffic flow improvement tactics as being inadequately documented in the SAAG plan.
- Deletion of the tactics for heavy-duty vehicle retrofit controls and alternative vehicle fuels which were contained in the SAAG plan.
- Revision of the SAAG estimate of emission reductions from a vehicle inspection and maintenance program to reflect partial implementation in 1982 and full implementation in 1983.
- Inclusion of emission reduction estimates for several ARB-proposed stationary source control measures which will be adopted by ARB if the county air pollution control district fails to adopt equivalent rules.
- A directive that the ARB executive officer evaluate the vehicle-related control tactics in the SAAG plan and modify, as necessary, the estimated emission reductions for these tactics.

Based on a finding that adequate commitments for further study were included in the SAAG plan, ARB concurred in the request for an extension of the ozone attainment deadline. The ARB resolution directed SAAG to undertake a more detailed assessment of alternative groups of transportation control measures, and to prepare an annual report on progress in achieving projected emission reductions and air quality improvements. SAAG was also directed to work with local agencies to develop a process for assuring consistency between the countywide growth forecasts in the nonattainment plan and local general plans. The ARB resolution also notes that the SAAG plan did not address the air quality implications of individual federally funded or approved projects (such as highway and wastewater treatment projects). Thus, a case-by-case analysis of consistency with the nonattainment plan is required for such projects.

Consistency Evaluation of the Proposed Project

Facility planning efforts have been based on the population projections noted in the Staging and Capacity Considerations section of Chapter 3, the 10- and 20-year grant funding criteria of EPA and the SWRCB, and an average noncanning season sewage generation rate of 164.5 gpcd (gallons per capita per day). The population projections used for the 1976 project report were ultimately based on a countywide forecast prepared by the California Department of Finance. This "D-100" series forecast was allocated by the SWRCB to the Modesto current sewer service area (CSSA). The project report developed a projection of sewered population by assuming that all growth in the CSSA after 1975 would be connected to the Modesto system. The 1976 project report forecast of sewered population does not incorporate any annexations of the 25,700 residents of the CSSA who were not connected to the Modesto system in 1975.

The flow projections and growth accommodation analyses presented in Chapters 3 and 4 of this EIS utilize different assumptions and procedures than those used in the 1976 project report. Major differences include incorporating an annexation estimate into the analysis; basing commercial and nonseasonal industry flows on total USSA population rather than just sewered population; utilizing two new population forecasts as a basis of analysis; and revising the estimates of sewage generation factors.

The SAAG nonattainment plan was based on a countywide California Department of Finance "E-150" series forecast. On a countywide basis, the E-150 forecast is larger than the D-100 forecast. Gruen Gruen + Associates have estimated the portion of this E-150 forecast which will occur in the City of Modesto (Table 5-8). Alternative subarea allocations of this E-150 forecast (one by SWRCB procedures, the other from the county planning department) are presented in Table A-28 of Appendix A. The Gruen Gruen + Associates Modesto area allocation of the E-150 forecast is lower than either the SWRCB or the county planning department allocations, thus, indicating a longer time frame for use of project capacity.

As noted in Chapter 4, construction of the proposed project is unlikely to affect recent or projected development rates in the Modesto area. Local agency planning (as well as planning by private development interests) inherently assumes that public services and facilities will be provided as needed. The capacity provided by the project will determine the time frame during which the project can serve expected growth, but will not determine the rate at which this growth occurs. Initial project construction provides less than 10 years of capacity under E-150 growth rates, while planned future construction provides a cumulative total of less than

20 years of capacity. The same conclusions apply even if none of the capacity increases is used to connect existing area residents who are annexed to the city over the next 20 years. Given the basic 10- and 20-year time frames for facilities planning under the Clean Water Grant Program, the proposed project should be viewed as being consistent with the growth forecast basis of the SAAG nonattainment plan. The ARB letter of comment on the Draft EIS (see Chapter 17) concurs with this conclusion.

Mitigation of Air Quality Impacts

Mitigation of growth-related air quality impacts of the project can be considered from two perspectives. One approach would be to identify measures which, if implemented, would reduce pollutant emissions in the project service area to the level identified under a "no project" forecast. The types of measures considered under this strategy would involve actions undertaken directly by the City of Modesto as well as actions which other public agencies would agree to implement at the request of the City of Modesto. The extent of emission reductions potentially required by such an "emission offset" approach has been identified in Appendix K.

The second basic approach to air quality mitigation would focus on the city's participation in a regional air quality management program which can demonstrate a reasonable probability of achieving and maintaining federal air quality standards within the time frames established by the Clean Air Act.

The two basic approaches outlined above are not mutually exclusive. The City of Modesto is already committed (Resolution 76-1018) to assisting in the development and implementation of air quality management programs in Stanislaus County. The city has also made commitments to implement various measures as part of the locally adopted nonattainment plan. These measures include improved public transit, traffic flow improvements, bicycle lanes and storage facilities, and flexible work hours for city employees. The city is also using methane (from the sludge digesters at the primary treatment plant) to run certain city vehicles on an experimental basis. The transit measures supported by the city under the nonattainment plan include purchase of three buses, study of a downtown bus terminal, and improved bus maintenance facilities.

Most of the air quality mitigation measures which the City of Modesto can directly implement involve tactics to reduce vehicle travel. The following six broad categories of such measures have been addressed in Appendix K.

- Improvements in public transit systems.
- Measures to increase carpooling and ridesharing.
- Disincentives to automobile use.
- Encouragement of employer-sponsored actions.
- Development of a comprehensive bicycle circulation system.
- Land use planning program support for measures reducing vehicle travel.

As noted above, the SAAG nonattainment plan (as modified by ARB) appears to adequately account for emissions from population growth accommodated by the proposed project. Thus, processing of the city's grant request is expected to proceed even though a State Implementation Plan (SIP) revision for Stanislaus County has not yet been submitted to EPA. Award of "Step 3" (actual construction grant) funding will be contingent on EPA approval of the SIP revision for Stanislaus County or development of project-specific air quality mitigation measures.

EPA approval of the SIP revision (with the requested extension of the ozone attainment deadline) would preclude the need for any further project-related air quality mitigation. EPA disapproval of the SIP revision may necessitate action by the City of Modesto to develop and implement a project-specific air quality mitigation program. Appendix K contains a project-specific air quality analysis (originally presented in the text of the Draft EIS) which could serve as a basis for project-specific air quality mitigation if that becomes necessary.

Chapter 7

OTHER IMPACTS OF URBANIZATION

Future development accommodated by the proposed project will exert numerous impacts in addition to the land use, farmland and air quality impacts discussed in previous chapters. The following sections discuss several of these additional issues.

Traffic Congestion

Population growth supported by increased wastewater treatment plant capacity will add traffic loads to the existing roadway system of the area. Roadway elements which currently experience significant congestion may be further impacted by additional development.

An increase in population in the area generally north of the city will have an adverse impact on McHenry Avenue (Route 108), the traffic corridor with the most critical congestion problems in the urban area (SAAG, 1978c). Traffic flow data collected by the City of Modesto indicate that in a 24-hour period, as many as 38,500 vehicles travel on McHenry Avenue at the Orangeburg intersection (City of Modesto, 1978c). Because there are no major north-south streets parallel to McHenry for a considerable distance, the north area is dependent on Route 108 for access to the commerce on McHenry itself and to the downtown central business district. McHenry Avenue has average daily traffic (ADT) flows greater than any other roadway in the area, including State Highway 99.

Unlike most critical congestion areas, peak traffic flows on McHenry occur during mid-day, instead of morning and afternoon commute hours. This is attributable to many short trips driven between shopping and business development on McHenry Avenue. A corridor study prepared by the California Department of Transportation (Caltrans) found that only 3.5 percent of the traffic travelled the full length of the corridor, from Standiford to Needham (Caltrans, 1977). Because of the preponderance of short trips, the "side congestion" (cars turning on and off of McHenry) is more critical than the "flow-through congestion" of traffic once on McHenry. Thus, population increases in the north area may increase the use of McHenry Avenue for access to the downtown area and increase "flow-through congestion". But more seriously, population growth in any area could increase the demand for McHenry commercial development and result in more severe congestion and increased accident potential on this heavily used arterial.

Long-term projections in the Route 108 Corridor Study (Caltrans, 1977) show that traffic will continue to exceed the capacity of McHenry Avenue; the study concluded that the ultimate solution must be a major reconstruction of the whole corridor and that a one-way couplet system would provide maximum benefits.

To date, none of the suggested major reconstructions has been included in the SAAG Transportation Plan. The draft 1978 update does, however, include several of the minor improvements suggested by the Caltrans Corridor Study. These recommendations are included in the Transportation System Management Element (TSM), which is designed to propose low-cost improvements that will increase the efficiency of the existing transportation system. At McHenry Avenue and Briggsmore the TSM Element would modify the signals and add left-turn phases, thereby relieving "side congestion". New, more efficient traffic controllers are recommended at Roseburg, Granger, Briggsmore, Bowen, Floyd and Orangeburg, thereby increasing capacity at each intersection by 5 percent. By removing the traffic island at Orangeburg, accidents would be reduced but capacity would not be increased (SAAG, 1978c).

The TSM element also recommends that the headway time between buses on Modesto Motor Bus Service (MMBS) Route 6 (which serves the McHenry corridor) be decreased from 45 to 30 minutes. While this improvement would benefit service to the corridor, Caltrans (1977) concluded that transit improvements could not substantially reduce traffic or improve safety without a significant coincident change in auto usage patterns.

Several other areas of existing critical traffic congestion are within the potential service area of the sewage treatment facility and could be affected by increases in population. The existing 2-lane bridge on State Route 132 between "D" Street and Las Flores Avenue currently limits the traffic capacity between downtown Modesto and the areas to the east (SAAG, 1978c). Any development east of downtown would increase traffic on Route 132 beyond its current ADT of about 17,500 (SAAG, 1978c) and worsen the existing problems.

The SAAG Transportation Plan recommends the construction of an additional bridge on an adjacent street and the creation of a one-way couplet to relieve the capacity problem (SAAG, 1978c). The proposed improvement is part of the Caltrans 6-year plan, and would be eligible for Federal Aid Urban (FAU) funding; however, the promise of funding is, at this stage, still uncertain.

Population growth in the east and northeast areas would also heighten congestion on Scenic Drive, which extends easterly from the downtown area (SAAG, 1978c). Current ADT is about 21,000 vehicles per day. Widening of the remainder of the road to four lanes is part of the planned status of street and road facilities in 1995 and is considered to be the most realistic proposal for congestion relief (SAAG, 1978c).

Congestion on roadways connecting the areas east of Modesto to the downtown area may be slightly improved, but not solved, as a result of the addition of a reverse loop on MMBS Route 4; decreases in both headway and travel time will make the bus system more efficient for riders, but will not guarantee that congestion and safety hazards on Scenic Drive and Route 132 will be substantially reduced. The proposed reverse loop in contingent on the approval of a Mass Transportation Act (UMTA) grant, which will enable the City of Modesto to purchase five new buses (City of Modesto, 1977a); the Route 4 reverse loop will be possible when the new buses are delivered, a maximum of ten months after the grant is formally approved and the contracts are signed (Carmody, pers. comm.).

Traffic volumes on Standiford Avenue have jumped substantially since the opening of the Vintage Faire Regional Shopping Center at the corner of Veneman Avenue and Dale Road. In 1975, before construction of the shopping complex, traffic volumes ranged from 2,000 to 6,000 ADT; current volumes range from 11,000 to 14,700 ADT (SAAG, 1978c). As population in the areas north of the city increases, both the traffic levels on Standiford, as well as the business at the shopping center will grow. The long-range transportation plan includes development of Standiford to four lanes in 1995 (SAAG, 1978c), which will help remedy the existing and future congestion problems.

Access to the Vintage Faire Shopping Center from the downtown area will also benefit from the eventual arrival of the new buses provided by the UMTA grant. One of the buses will be added to MMBS Route 7 and will facilitate a reduction in headway time (City of Modesto, 1977a). This improvement will not, however, alleviate the need for road improvements on Standiford Avenue.

Noise

Provision of additional sewerage capacity will accommodate the development of new residential land uses in geographic areas which have not previously been subjected to noise levels associated with urban and suburban land uses.

Noise levels in existing urban areas will also be affected by population growth served by the project. Transportation corridors between employment, shopping, business and entertainment facilities and the locations of new development will experience higher traffic volumes which could result in greater noise levels. Noise levels from highway traffic are, however, sensitive to both traffic volumes and vehicle speeds. Where increased traffic volumes are accompanied by congestion and reduced vehicle speeds, there may be little if any noise increase. A recent survey of noise levels in the City of Modesto indicated that noise levels had increased along some major streets, but that interior neighborhood noise levels were essentially the same as those monitored in 1971 and 1972 (Fogel, 1978).

It should perhaps be noted that recent data show that efforts by manufacturers to meet fuel economy standards may result in an energy-noise tradeoff problem. EPA test data show that today's fuel-efficient subcompact cars and diesel-equipped light motor vehicles are noisier than the average noncompact cars. Noisy, fuel-efficient vehicles might become an increasing percentage of new vehicle sales with the increased marketing emphasis being placed upon them by the auto industry (Thomas, 1978). Noise controls on light motor vehicles currently depend on voluntary actions by manufacturers.

Resource and Energy Use

Population increases in the study area will use energy in the residential and transportation sectors and could stimulate consumption in the commercial and industrial sectors. The principal energy sources are natural gas, electricity, and petroleum fuels.

Stanislaus County experienced a continuous growth in natural gas consumption until 1973. Since then the net effect has been a decrease in natural gas consumption. "Although more than 2,000 new customers were added to PG&E's Stanislaus District in 1976, yearly consumption for the county dropped by approximately 1-1/2 billion cubic feet in the same period" (SAAG, 1977a). The SAAG report cites the curtailment of large industrial customers, increased costs, and conservation consciousness for decreases in 1976 gas consumption.

According to the State Energy Commission consumption by residences, small businesses and small industries (firm customers) dropped almost three times as much as use by large industrial and electric generating plants (interruptible customers) with declines of 54 and 19 billion cubic feet, respectively. Sales to interruptible customers decreased because of lower supply while sales to firm customers dropped because of the warm winters which accompanied the drought (California Energy Resources Conservation and Development Commission, 1976).

An analysis of average monthly temperatures substantiates the Energy Commission interpretation. The months of January-February and November-December were relatively warm in 1976.

Table 7-1 shows County residential electric consumption by user. Recent trends indicate that although the number of users continues to rise, consumption has not risen proportionately because of decreases in user consumption rates.

Future trends in the availability and consumption of energy resources are difficult to predict. Because there are no significant sources of energy in Stanislaus County at present, the local availability of energy will be more closely related to regional and global trends in energy sources and supplies.

The Modesto Irrigation District (MID) and Turlock Irrigation District (TID) currently own a small generating facility at Don Pedro Reservoir and have entitlements to power from the City and County of San Francisco's Hetch Hetchy System. Rising demand and the unreliability of future Hetch Hetchy supplies has forced the Modesto and Turlock utilities to seek out new supplies. PG&E, which hopes to build two 1.2 million kilowatt nuclear reactors in eastern Stanislaus County by 1988, has offered a 200,000 kilowatt power share to the local utilities. MID and TID are currently involved in a search for water for nuclear cooling.

The capacity of the utility system to provide service will be determined by the capacity of its individual parts such as: the distribution system (natural gas pipelines, high voltage cables), utility personnel (service representatives, engineers, construction and installation crews, repair persons), or equipment for constructing or servicing the distribution system (ladder trucks, trenchers, etc.). Although specific capacity information is not available, MID does not anticipate any delays in service due to advance planning in cooperation with the city and county staffs (C. Viss, pers. comm.).

Growth in energy demand will affect all consumers in the Modesto area. Even though energy prices are heavily regulated by government agencies, rising demand and limited supplies will eventually result in rising prices. The situation in electrical energy will seem especially acute since the hydroelectric power supplies were available at a low cost relative to needed additional supplies.

Table 7-1

ELECTRIC CONSUMPTION PER USER

Year	Utility	Description of Service	Users[1]	% Change	Total KWH	Total % Change	Per Customer KWH	Per Customer % Change
1977	TID	Domestic + Farm	29,381	(2)	296,526,596	(-.04)	10,092	(-2)
	MID	Domestic	48,001	(5)	399,944,281	(.03)	8,332	(-5)
1976	TID	Domestic + Farm	28,855	(4)	297,612,238	(5)	10,314	(1)
	MID	Domestic	45,691	(5)	398,900,213	(5)	8,730	(.02)
1975	TID	Domestic + Farm	27,853	(3)	283,196,347	(6)	10,168	(3)
	MID	Domestic	43,718	(10)	381,035,054	(8)	8,716	(3)
1974	TID	Domestic + Farm	26,931	(4)	266,331,254	(3)	9,889	(-1)
	MID	Domestic	41,838	(5)	354,196,281	(4)	8,466	(-1)
1973	TID	Domestic + Farm	25,954	(7)	259,641,422	(7)	10,004	(.0)
	MID	Domestic	39,793	(2)	341,459,349	(7)	8,581	(5)
1972	TID	Domestic + Farm	24,356	(6)	243,483,065	(11)	9,997	(5)
	MID	Domestic	39,082	(8)	319,396,433	(10)	8,172	(2)
1971	TID	Domestic + Farm	23,007		219,419,491		9,537	
	MID	Domestic	36,112		289,838,176		8,026	

NOTES: TID = Turlock Irrigation District
MID = Modesto Irrigation District

[1] One user represents one metered customer. The number of users may be slightly less than the total of households which consume electricity because of possible cases of single metered multiple units.

SOURCE: MID and TID files.

Hydrologic Impacts of Urbanization

Urban development of agricultural lands in northern California has been associated with diminished recharge and augmented storm runoff. Where natural water courses receive the increased storm peak flows, channel erosion and greatly increased sediment loads may also occur. The hydrologic impacts of urbanization in the Modesto area are discussed below in the context of water supply and water quality conditions.

Water Supply Impacts

All municipal and industrial water supplies in the Modesto area are obtained from groundwater resources. In this area groundwater occurs in alluvial aquifers that vary from unconfined to fully confined, and in a deeper, partly consolidated aquifer (Page, 1972). The quality of water stored in these aquifers deteriorates with depth below the ground surface. The effective base of the fresh water body is placed at a depth of about 700 feet beneath the western part of the city, and is probably at a shallower depth beneath the eastern part.

Groundwater aquifers in this area are recharged by percolation of incident rainfall, and percolation through natural stream beds as well as an extensive system of irrigation canals and ditches, and deep percolation from irrigated agricultural lands. Because of the regional nature of aquifers in this part of the San Joaquin Valley, high withdrawals in one area tend to be offset by increased inflows from other parts of the groundwater aquifer and from the major streams and canals. Obviously, there is a gradual, but definite limit to this adjustive capacity. However, there are no indications that this limit is presently being approached. Available information on groundwater levels in the Modesto area do show that a cone of depression exists under the city of Modesto. However, this cone had remained in a fairly stable condition between 1952 and 1962 (Page, 1977). Preliminary evaluations have indicated no significant change in water levels between 1962 and 1978 (Londquist, pers. comm.).

Based on the above information, it appears that the impact of urbanization in the Modesto area on recharge to groundwater aquifers has been relatively minor. This can be attributed to the following factors:

1. A relatively low precipitation level of 12 inches per year.

2. A relatively high irrigation water use of 36 to 42 inches per acre per year which is in most part diverted from the Sierra streams.

3. Substantial and probably increasing rates of recharge from the Tuolumne River and other surface sources.

4. Percolation of a major portion of urban runoff through numerous "down" or "rock-filled" well and percolation basins.

5. Large seasonal application of irrigation water to lawns and other urban green space.

6. Urbanization of lands overlying perched water tables or soils of very low permeability.

The future impacts of urbanization of agricultural lands on groundwater supplies in the Modesto area are difficult to assess without the use of a regional groundwater model. The U. S. Geological Survey has been engaged in the development of such a model over the past several years. This work is expected to be completed during the 1980 calendar year (Londquist, 1979). Once completed, it will be feasible to use this model to evaluate the impact of various urban development scenarios on groundwater supplies in the Modesto area. In the absence of such a tool the following general comments can be made:

1. Future urbanization in the Modesto area may not have a significant impact on the hydrologic balance of regional groundwater aquifers. This will be especially true if urbanization occurs over areas of poor soil permeability or perched water table conditions. However, increased local pumpage for meeting the water supply needs of future populations may significantly exceed the rate at which water can flow from the surrounding areas to the well fields and may result in large drops in water levels below the city of Modesto.

2. The adverse impacts of future urbanization on groundwater supply conditions can be mitigated by taking one or both of the following steps:

    a. Proper design of well fields to avoid large concentration of wells in a limited geographical area.

b. Development of supplemental surface or groundwater supplies.

Water Quality Impacts

Urbanization of agricultural lands in the Modesto area may have direct and indirect impacts on groundwater quality in this area. The direct impacts of conversion of land from agricultural to urban uses may result from the elimination of the input of chemicals used for increasing crop yields and for reducing crop losses caused by natural pests. Although some chemical fertilizer use will continue on urban green space, the net effect of this conversion will be a reduction in per acre input of chemicals in the groundwater body. On the other hand, if "down wells", and percolation basins are used extensively for disposal of urban runoff, a broad range of organic inorganic chemicals may be discharged into the groundwater body. Oil, grease, petroleum, various heavy metals, and other toxic compounds are usually contained in urban runoff. Therefore, runoff disposal wells and basins may have an undesirable impact on the quality of groundwater supplies. The extent and severity of such impact should be determined through a monitoring program and appropriate steps should be taken for alleviating any adverse impact.

The indirect impacts of urbanization in the Modesto area on the quality of groundwater resources in this area are closely related to water level conditions in this area. If increased groundwater pumpage in the future results in a large drop in water levels below the city, a deterioration in the quality of water supplies may result due to the need for pumping deeper and poorer quality waters in the aquifers. However, the tendency toward deterioration may be in large part offset by the increased rate of recharge of generally high-quality water from the Tuolumne River and other streams and canals. The salinity content of the river has been sharply diminished during the past two years, since the Regional Water Quality Control Board plugged seven gas wells discharging up to 40 cubic feet per second of saline waters. Other recent pollution control measures are also contributing toward enhancement of local surface and groundwater quality.

Chapter 8

IMPACTS OF EFFLUENT IRRIGATION ON SOILS, CROPS AND GROUNDWATER

Alternative Irrigation Areas and Operational Procedures

During preparation of the 1976 Jenks and Harrison project report, all irrigation districts and major property owners in the vicinity of the oxidation ponds were contacted to determine their interest in utilization of oxidation pond effluent for a portion of their irrigation water supply. The two largest irrigation districts, the Modesto Irrigation District and the Turlock Irrigation District expressed no interest, as they have sufficient water from the Don Pedro Dam. However, several parties indicated an interest in the possibility of using pond effluent for irrigation purposes. These parties include the West Stanislaus Irrigation District, the Mapes Ranch (Lyons property), the Hailwood Ranch (Chase property), and the Gomes Brothers, Ott, Rogers, Souza, and Wagler Ranches.

The 1979 project report supplement has developed eight alternative concepts for effluent distribution. A basic premise which was followed in the development was that no alternative would include both the Lyons property and the West Stanislaus Irrigation District (WSID). This decision was made because either of these two users could accept all of the effluent, and relatively long pipelines would be required to reach either user. However, each of the eight alternatives included either the Mapes Ranch or the WSID, since the sum requirement of the other potential users is insufficient for projected flows. In addition, the Chase property was included in all alternatives, as a prior court decision stemming from the city's condemnation of the existing oxidation pond site awarded the Hailwood Ranch rights to as much of the pond effluent as was desired. The eight effluent distribution alternatives which were developed are:

A. Chase, WSID
B. Chase, WSID, Gomes
C. Chase, WSID, Gomes, Ott
D. Chase, WSID, Gomes, Rogers, Souza
E. Chase, Lyons
F. Chase, Lyons, Gomes
G. Chase, Lyons, Gomes, Ott
H. Chase, Wagler, WSID, Gomes

A matrix showing the annual flow distribution for each of these alternatives is presented in Table 8-1. It should be noted that while other combinations are possible, evaluation of the eight concepts is sufficient to determine the overall cost effectiveness of land application. Figures 8-1 through 8-4 present layouts of the distribution system for each of the eight alternatives. In all alternatives, the Chase property would be served disinfected effluent through a 36-inch force main, 3,000 feet long, requiring 50 horsepower of installed pumping capacity. Following is a description of each of the eight alternatives (the 1979 project report recommends Alternative B):

Alternative A - Chase, West Stanislaus I.D.

Disinfected effluent would be required by each user. A 54-inch force main, 41,800 feet long would be required to serve the WSID. Pumping for this force main would require 400 horsepower of installed pumping capacity.

Alternative B - Chase, West Stanislaus I.D., Gomes

Disinfected effluent would be required for each user. To serve WSID and Gomes, 48,500 feet of force main would be required, varying between 33 and 54 inches, and requiring 500 horsepower of installed pumping capacity.

Alternative C - Chase, West Stanislaus I.D., Gomes, Ott

Effluent would be disinfected for all users except Ott, but Ott would receive disinfected effluent when other users are being supplied concurrently. To serve WSID, Gomes, and Ott, 31,300 feet of force main ranging from 27 to 54 inches in diameter would be required. Pumping would require 500 horsepower of installed pumping capacity.

Alternative D - Chase, West Stanislaus I.D., Gomes, Rogers, Souza

Two major force mains would be required. The Gomes, WSID force main would be 48,500 feet long and would range from 33 to 54 inches. The Rogers, Souza force main would be 23,000 feet long and would range from 15 to 24 inches in diameter. Installed pumping horsepower would be 550 for the Gomes, WSID force main and 60 for the Rogers, Souza force main. Effluent in the Rogers, Souza force main would not be disinfected.

Table 8-1

SUMMARY OF EFFLUENT DISTRIBUTION ALTERNATIVES

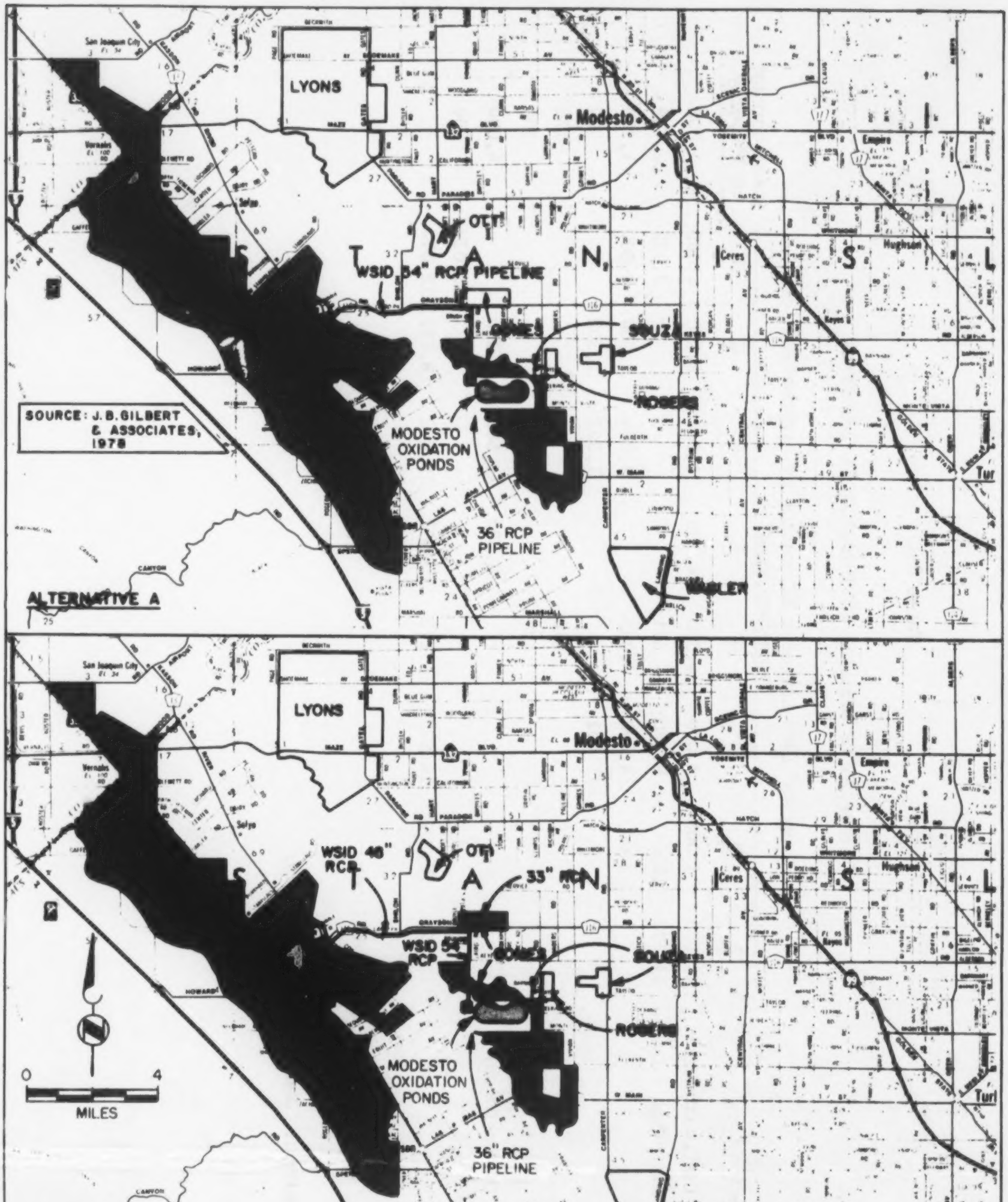
Irrigation User	Proposed 1989 Effluent Allocation by Alternative (acre-feet/year) A	B	C	D	E	F	G	H	Total Acreage of Property
Chase (Hailwood Ranch)	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	2,000
West Stanislaus I.D.	14,672	10,671	9,370	9,354				7,632	22,429
Gomes		4,000	4,000	4,000		4,000	4,000	4,000	1,240
Ott			1,302			1,302	1,302		500
Rogers				540					160
Souza				777					230
Lyons (Mapes Ranch)					14,672	10,681	9,370		6,000
Wagler								3,039	900
TOTALS	18,672	18,672	18,672	18,672	18,672	18,672	18,672	18,672	

Note: 1 acre-foot = 325,900 gallons.

DATA SOURCE: Jenks & Harrison, 1979.

FIGURE 8-1

AGRICULTURAL IRRIGATION ALTERNATIVES


LYONS
Modesto
San Joaquin City
Vernalis
Empire
Hughson
Ceres
Keyes
Turl
OTT
WSID 54" RCP PIPELINE
GOMES
SOUZA
ROGERS
MODESTO OXIDATION PONDS
36" RCP PIPELINE
WAGLER
ALTERNATIVE A
WSID 48" RCP
33" RCP
WSID 54" RCP
ALTERNATIVE B
0
4
MILES
S T A N I S L

SOURCE: J. B. GILBERT & ASSOCIATES, 1978

FIGURE 8-2

AGRICULTURAL IRRIGATION ALTERNATIVES

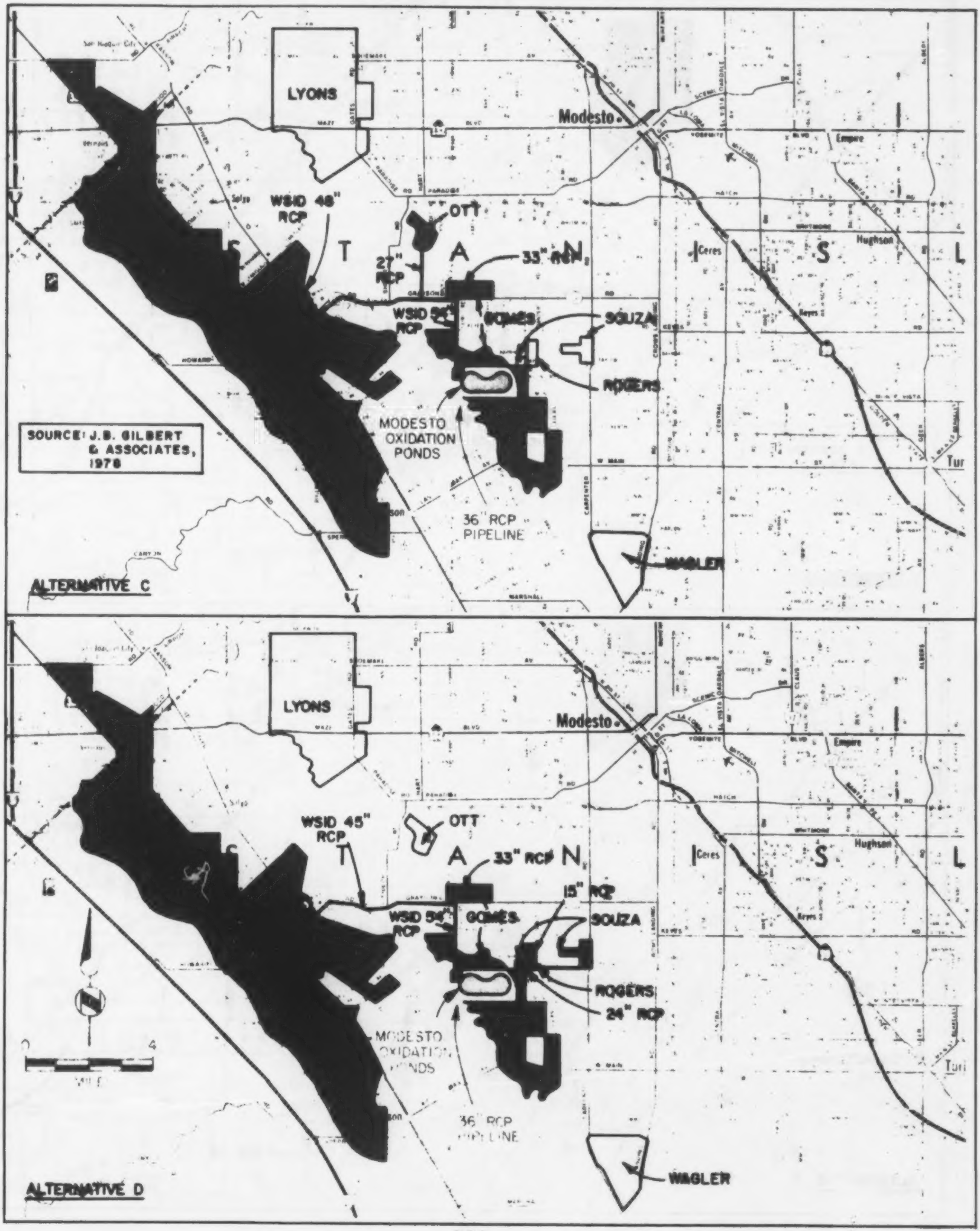

LYONS
Modesto
Empire
Hughson
Ceres
Keyes
Turl
S
T
A
N
I
S
L
WSID 48" RCP
OTT
27" RCP
33" RCP
WSID 54" RCP
GOMES
SOUZA
ROGERS
MODESTO OXIDATION PONDS
36" RCP PIPELINE
WAGLER
SOURCE: J.B. GILBERT & ASSOCIATES, 1978
ALTERNATIVE C
WSID 45" RCP
OTT
33" RCP
15" RCP
WSID 54" RCP
GOMES
SOUZA
ROGERS
24" RCP
MODESTO OXIDATION PONDS
36" RCP PIPELINE
WAGLER
0
4
MILE
ALTERNATIVE D

FIGURE 8-3

AGRICULTURAL IRRIGATION ALTERNATIVES

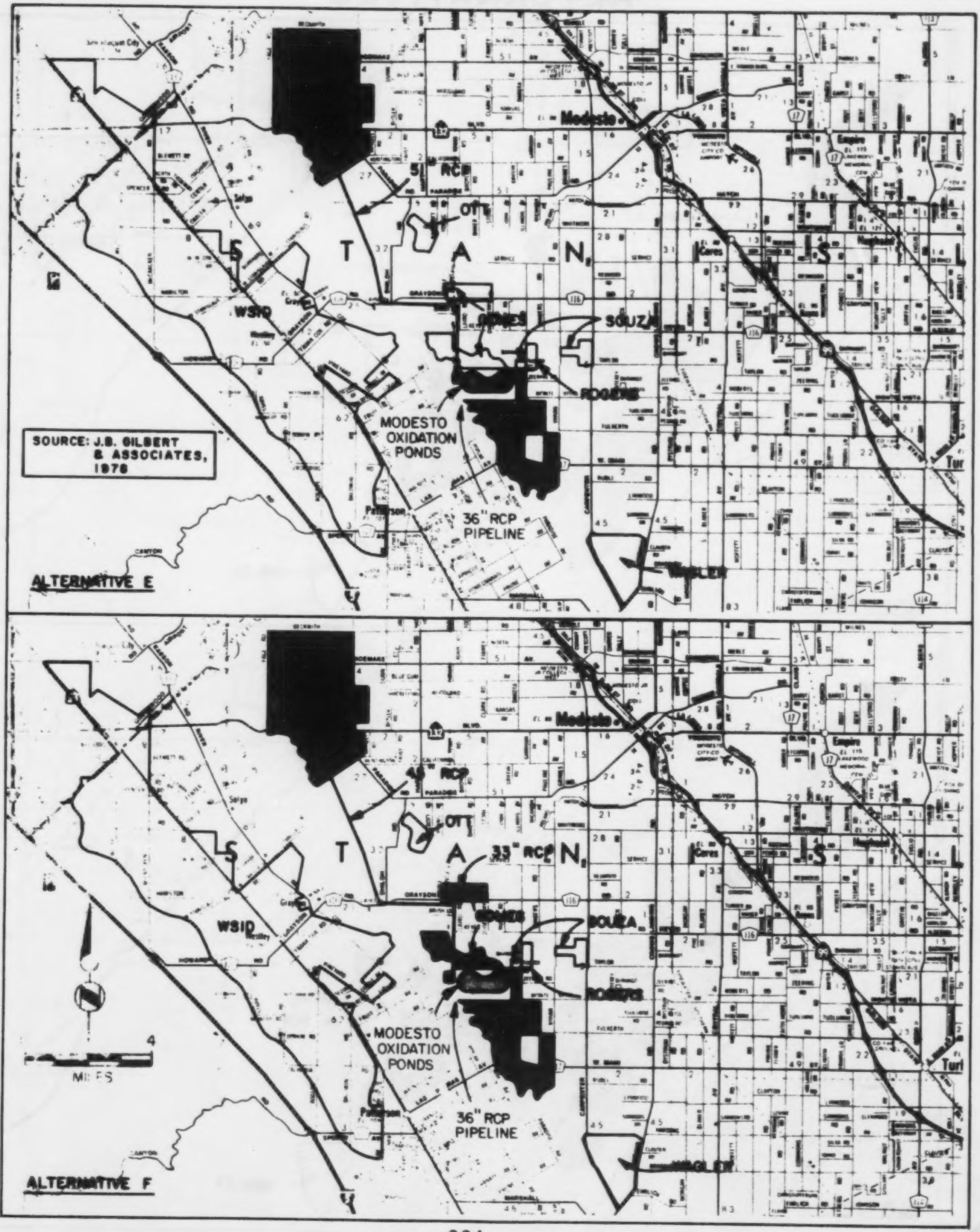
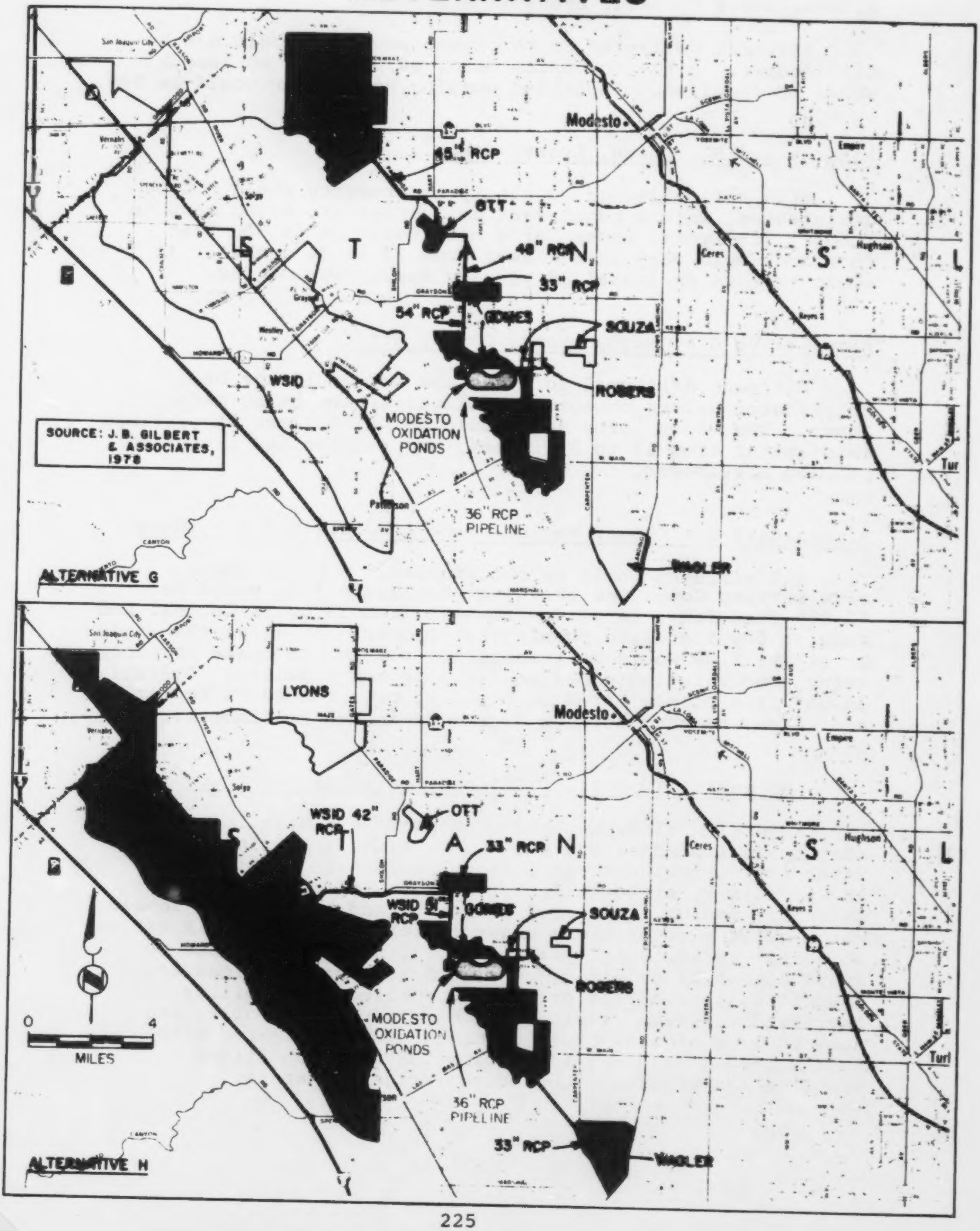

Modesto
Empire
Ceres
Patterson
WSID
51" RCP
OTT
S T A N I S L
GOMES
SOUZA
ROGERS
MODESTO OXIDATION PONDS
36" RCP PIPELINE
ZIEGLER
SOURCE: J.B. GILBERT & ASSOCIATES, 1978
ALTERNATIVE E
48" RCP
33" RCP
4
MILES
ALTERNATIVE F

FIGURE 8-4

AGRICULTURAL IRRIGATION ALTERNATIVES


SOURCE: J.B. GILBERT & ASSOCIATES, 1978

ALTERNATIVE G
San Joaquin City
Vernalis
Modesto
Empire
Ceres
Hughson
Grayson
Westley
Patterson
45" RCP
OTT
48" RCP
33" RCP
54" RCP
GOMES
SOUZA
ROGERS
WSID
MODESTO OXIDATION PONDS
36" RCP PIPELINE
WAGLER
S T A N I S L
ALTERNATIVE H
LYONS
WSID 42" RCP
WSID 51" RCP
33" RCP
36" RCP PIPELINE
33" RCP
0
4
MILES

Alternative E - Chase, Lyons

Effluent delivered to the Lyons property would not be disinfected. A 51-inch force main, 60,000 feet in length would be required. Installed pumping horsepower would be 500.

Alternative F - Chase, Lyons, Gomes

Effluent delivered to the Lyons property would not be disinfected, unless concurrent deliveries are being made to Gomes. The Lyons, Gomes force main would be 66,700 feet long and would vary in diameter from 33 to 54 inches. It would require an installed pumping horsepower of 550.

Alternative G - Chase, Lyons, Gomes, Ott

Effluent delivered to Lyons and Ott would not be chlorinated unless concurrent deliveries are being made to Gomes. The major force main would be 64,700 feet long, range in diameter from 33 to 54 inches, and require 500 installed pumping horsepower.

Alternative H - Chase, Wagler, West Stanislaus I.D., Gomes

All effluent would be chlorinated. A major force main serving Gomes and the West Stanislaus I.D. would be 48,800 feet long, range in diameter from 33 to 54 inches, and require 500 installed pumping horsepower. To serve the Wagler property, flow would be transported across the Chase property using some existing pipeline and some new pipeline. Overall, 26,000 feet of new pipeline would be required to serve Wagler and Chase, ranging between 33 and 39 inches in diameter.

Potential Impacts of Effluent on Soils and Crops

Several quality aspects of Modesto effluent indicate that special precautions should be taken in reusing this water for agricultural irrigation purposes. As discussed in Appendix F, effluent from the oxidation ponds exhibits salinity, sodium, chloride, nitrogen, and bicarbonate levels which could pose problems under certain conditions. A variety of normal agricultural practices can, however, be used to avoid potential problems. Where management practices are insufficient to offset problems, impaired permeability and increased salinity levels could be produced in soils, and some adverse effects could occur in crops irrigated with this water. Table 8-2 identifies the soil conditions found on the various alternative irrigation areas.

Table 8-2

SUITABILITY OF SOILS FOR EFFLUENT APPLICATION AT POTENTIAL IRRIGATION SITES ON INDIVIDUAL FARMS

Major Soil Series	Capability Units or Storie Index Grade	Property Where Located	Surface Textures	Drainage	Permeability	Comments
Columbia	IIw-2	Chase, Lyons, Ott	Loam, silt loam, fine sandy loam	Imperfect	Moderate	Some salinity/alkalinity; uniform profile
Dinuba	IIw-3	Chase, Gomes, Lyons, Rogers, Souza, Wagler	Fine sandy loam, sandy loam	Imperfect	Moderate	Some salinity/alkalinity; uniform profile
Fresno	IIIs-8, IVs-8, VIs-8	Chase, Gomes, Lyons, Rogers, Souza, Wagler	Fine sandy loam, sandy loam	Imperfect	Slow to very slow	Widespread salinity, alkalinity; prismatic, clayey subsoil; underlain by hardpan; hard to reclaim
Grangeville	IIw-2	Gomes, Lyons, Ott	Very fine sandy loam to sandy loam	Imperfect to good	Moderate to moderately rapid	Some salinity/alkalinity; uniform profile
Hanford	I-1	Gomes, Souza	Sandy loam	Good	Rapid	Uniform profile
Modesto	IIs-6, IIs-7	Lyons	Loam, clay loam	Moderately good	Slow to very slow	Slightly saline-alkali; blocky to prismatic subsoil
Rossi	IVw-6, VIw-6	Lyons, Wagler	Clay, clay loam	Poor	Very slow	Widespread salinity, alkalinity; blocky subsoil; hard to reclaim
Temple	IIw-2, IIIw-6	Chase	Loam, silty clay loam	Poor	Slow	Saline/alkali
Traver	IIs-6, IIIs-6, IVs-6	Lyons	Fine sandy loam, sandy loam	Moderately good	Slow to moderate	Widespread salinity, alkalinity, but fairly easily reclaimed
Waukena	IIIs-8, IVs-8, VIs-8	Chase, Gomes, Lyons, Wagler	Fine sandy loam, sandy loam	Imperfect	Very slow	Widespread salinity/alkalinity; columnar clayey subsoil; alkaline claypan substratum; hard to reclaim
El Solyo	2, 3	WSID	Silty clay loam	Imperfect	Moderately slow	Calcareous
Myers	3	WSID	Clay	Imperfect	Slow	Vertisols, deep cracks when dry
Salado	1, 2	WSID	Loam, sandy loam	Good	Moderately rapid	Uniform profile, calcareous subsoil
Stomar	1, 2, 3	WSID	Clay loam	Good	Slow	Heavy, calcareous subsoil
Vernalis	1, 2	WSID	Loam, clay loam	Good	Moderate	Moderately developed profile
Zacharias	1, 2	WSID	Loam, clay loam	Good	Moderate	Deep, permeable subsoil

SOURCE: Appendix F.

Table 8-3 indicates potential crop yield reductions which would be associated with the use of Modesto effluent as an exclusive water supply source, assuming a 15 percent leaching fraction. Either mixing effluent with good quality irrigation supplies or alternating irrigations with effluent and with good quality water would essentially eliminate, for most crops, any salinity impacts attributable to irrigation with effluent. It is important to note that the yield reduction estimates shown in Table 8-3 are based on salinity effects alone, and do not include possible beneficial effects or changes in crop quality which may be associated with other effluent constituents. Trace element levels in Modesto effluent are so low that adverse impacts are not expected to occur (see Appendix F).

The proposed alternative effluent distribution plans allocate water to users at a maximum rate of 3.4 acre-feet per acre per year for several individual farms located east of the San Joaquin River. For assumed irrigation rates in these areas, this effluent application rate would supply as much as 80 percent of the applied water demand for crops grown. Although this level of effluent application relative to freshwater application would probably not cause significant adverse impacts in most of these areas, lower application rates may be preferable for poorly drained or heavy textured soils. Flexibility in distribution scheduling and facilities should allow for the broadest allocation possible in order to minimize any single user's reliance on this water as a source of irrigation supply. The minimization of effluent application rates is an environmentally and economically attractive mitigation measure. Using this approach to water reclamation, adverse impacts are proportionally minimized, and less management is consequently required to overcome any resultant problems.

Potential Impacts of Effluent on Groundwater

The reuse of Modesto effluent for agricultural irrigation may impact groundwater quality in several ways. Additional salt and nitrogen loadings in agricultural return flows could degrade groundwater quality in terms of its suitability for irrigation

Table 8-3

POSSIBLE SALINITY-INDUCED CROP YIELD REDUCTIONS FROM THE USE OF MODESTO EFFLUENT

Yield Reduction	Crop
none	Barley Broccoli Cucumber Tomato Soybeans Sugarbeets
0 - 10%	Alfalfa Cabbage Cantaloupe Corn Pear Peppers Spinach Walnut
10 - 25%	Almonds Apricots Beans Blackberry Boysenberry Carrots Lettuce Onions Radish Raspberry Squash
25 - 50%	Strawberry

Note: Assumes that Modesto effluent is the exclusive irrigation water source, and that a 15 percent leaching fraction is used.

DATA SOURCE: Ayres and Westcot, 1976.

or domestic use, and the deep percolation of specific pathogenic or toxic substances contained in effluent could also affect the quality of domestic supply aquifers. The contamination of developed aquifers can occur through deep percolation of agricultural leachates or through seepage into damaged well casings. The probability that harmful substances contained in effluent would be transmitted to groundwater supplies is less in the former case than in the latter, due to the purifying effects of filtration through the soil and underlying layers of sediment.

The domestic water supplies which may possibly be affected by the irrigation reuse of effluent are primarily the shallow aquifers serving nearby farm homesteads. At least several farms draw their domestic water supplies from levels as shallow as 30 to 40 feet. Water samples from three domestic supply wells were analyzed as part of the effluent reuse project study conducted in 1977 and exhibited concentrations of total dissolved solids and nitrate as high as 1,024 mg/l and 30 mg/l, respectively (Jenks and Harrison, 1979). These quality characteristics indicate that recharge by agricultural irrigation drainage waters is occurring in these groundwater supplies.

The extent to which toxic substances derived from effluent may percolate into these water bodies and contaminate domestic supplies cannot be exactly determined. Salinity levels may increase, and this topic is addressed in subsequent paragraphs. Nitrogen levels will probably not exceed those derived from typical fertilizer-enriched agricultural leachates. Heavy metals and biological pathogens are generally subject to adsorption onto soil particles, significantly reducing their concentrations in percolating waters. This filtration effect increases with the depth of percolation and is related to soil texture, with finer textured soils acting as more effective filters than coarser textured soils. For Modesto effluent, it is unlikely that after percolation through at least 30 to 40 feet of soil and sediments, harmful substances would be transported in sufficient quantity to pose toxicity hazards. However, the presence of saturated conditions only a short distance below the ground surface may adversely affect the filtration process.

The salinization impact of effluent irrigation on groundwater would depend largely on 1) the difference in salinity between existing irrigation water supplies and effluent, and 2) the extent to which effluent would be used in place of existing supplies, or more specifically, the salt loadings in drainage waters attributable to effluent irrigation relative to the corresponding loadings from irrigation with existing sources. Nitrogen impacts could be produced by the application of effluent nitrogen in excess of the assimilative capacity of the soil-crop system. This topic is analyzed in detail in

Appendix F, with a conclusion that any additional nitrogen loadings due to effluent irrigation would be generally within the assimilative capacity of reuse sites, assuming given application rates and cropping patterns. Therefore, the receiving groundwater bodies should not experience any significant quality degradation due to effluent nitrogen loadings. The following paragraphs address the question of salinization impacts for groundwater bodies which would be recharged by effluent irrigation.

State regulations governing effluent irrigation require that no irrigation surface runoff be allowed to leave the reuse site. Thus, virtually all salts applied in irrigation waters remain in the soil or percolate to the local water table. Under the semiequilibrium conditions which would be developed following years of effluent irrigation, a balance is attained between salts added to soil through irrigation supplies and salts removed through drainage waters. If the effluent contains higher salt concentrations than most existing irrigation supplies, the additional salt loading would eventually enter the groundwater system.

An evaluation of water quality data presented in Appendix F indicates that Modesto effluent contains higher concentrations of the more soluble salts than all surface and groundwater supplies east of the San Joaquin River. The effluent tends to have a higher total salt load than most pumped waters in the WSID area, although the concentrations of individual constituents in the effluent, such as chloride, are more moderate than in many west-side wells. The relatively high levels of total salts and sodium ions in effluent may require salinity control measures or soil amendments in some effluent irrigated areas. Soil salinity control may entail increased leaching and, consequently, increases salt emissions to groundwater. Gypsum requirements of one to five tons per acre have been estimated for control of sodium effects, although a more conservative rate of application is likely. A residual of these applied salts will eventually enter the groundwater reservoir.

Due to the high levels of plant nutrients contained in Modesto effluent, it is likely that no additional fertilizer applications will be required at reuse sites where effluent is applied at the proposed rate of 3.4 acre-feet per acre. Therefore, a comparison between salt loadings due to irrigations with existing supplies and with effluent must take into consideration the reduction in fertilizer salt applications expected with effluent reuse. Fertilizer application rates vary by crop and soil type throughout the area proposed for effluent irrigation. In general, typical applications average about 200 pounds per acre per year, consisting primarily of nitrogen and superphosphate. Fertilizer is therefore a relatively small component of the salt budget, even if plant uptake is neglected.

Data in Table 8-4 give estimated values for the incremental change in salt loading due to use of effluent as an irrigation supply source in place of various freshwater sources. Assuming equal drainage volumes for freshwater and effluent irrigation regimes, additional salt loadings at sites east of the San Joaquin River where 80 percent of the irrigation demand would be supplied by effluent would range from 0.3 tons or 600 pounds per acre-foot for San Joaquin River water to 0.8 tons or 1,600 pounds per acre-foot for MID/TID water. For the WSID, where effluent applications would probably not exceed 50 percent of the applied irrigation water demand at any location, the difference in salt loading could range from a decrease of 0.2 tons or 400 pounds per acre-foot at sites presently irrigated by poor quality groundwater, to an additional loading of 0.15 tons or 300 pounds per acre-foot where WSID water is used exclusively. By subtracting fertilizer applications, as discussed above, the incremental salt additions due to effluent would be reduced by about 50 pounds per acre-foot, assuming an irrigation rate of 4 acre-feet per acre per year. The increased leaching fractions and the soil amendments which may be required for control of salinity and sodium effects would, in turn, tend to raise the values for incremental salt additions, although the degree of these impacts would depend entirely on site-specific factors such as individual management preferences, soil texture, high water table levels, and history of salinity or alkalinity problems. For a general analysis, these potential added salt emissions may be overlooked.

For estimating impacts on groundwater systems, the salt loadings attributable to effluent reuse must be examined in a geographic context which extends beyond the proposed reuse areas. The total volume of effluent to be delivered to users as an irrigation supply would amount to 18,670 acre-feet per year, or the equivalent of the total annual irrigation water demand of an area covering approximately 4,670 acres, assuming an applied irrigation rate of 4 feet per acre per year. The groundwater bodies which would be affected by drainage waters from effluent-irrigated sites are recharged by the agricultural irrigation of areas covering tens of thousands of acres both to the east and to the west of the San Joaquin River. When compared with the irrigation demand of these broader areas, the volume of effluent to be utilized as an irrigation supply would compose a small fraction of the total irrigation water supply. The increased salt loadings estimated above would probably not be significant in a broad context of receiving groundwater bodies, due to mixing and dilution with other recharge sources. Localized increases in groundwater salinity could be significant, however, especially where effluent is used to replace an irrigation water supply of very high quality, such as MID/TID water. In these areas, impacts would be experienced primarily as increased salt levels in shallow wells and in high water tables. The latter condition could produce additional salinity management difficulties in overlying soils.

Table 8-4

COMPARISON OF SALT CONTENT OF EXISTING IRRIGATION SOURCES AND MODESTO EFFLUENT

Source of Water	Representative Salt level (mg/1)	mg/1	Approximate salt increment from use of effluent[a] tons per acre-foot Percent of freshwater replacement 100 percent	80 percent	50 percent
Oxidation pond effluent	900				
Wells east of San Joaquin River	300-600	300-600	0.4-0.8	0.3-0.6	0.2-0.4
Laterals east of San Joaquin River	200-500	400-700	0.5-1.0	0.4-0.8	0.25-0.5
San Joaquin River	600	300	0.4	0.3	0.2
Laterals west of San Joaquin River	500	400	0.5[b]	0.4[b]	0.25
Wells west of San Joaquin River	700-1,000	-300-200	-0.4-0.3[b]	-0.3-0.25[b]	-0.2-0.15

[a] Ignoring salt contributions due to fertilizer additions with freshwater supplies.

[b] In the WSID, effluent applications would probably not exceed 50 percent of the total irrigation applications.

SOURCE: H. Esmaili & Associates.

Management Recommendations

Soils and Crops

Management practices which may be implemented by landowners to mitigate adverse impacts upon soils and crops include: 1) maintenance of an adequate leaching fraction, 2) application of gypsum or other soil amendments to maintain good soil structure and permeability, 3) control over high water table levels, 4) selection of resistant crop species or varieties, 5) mixing the effluent with good quality irrigation water supplies or alternating the use of these sources, and 6) minimization of effluent application rates. The city should compensate farmers for extra expenses incurred due to necessary management practices or revenue losses due to yield reduction, should they occur.

Groundwater

Suggested management practices include: 1) minimizing effluent applications either by using combined freshwater and effluent supplies, or by maximizing irrigation efficiencies at given sites, hence, maximizing the effluent distribution area, and 2) minimizing drainage volumes. Although the latter measure would appear to contradict the usual salinity management requirements of high leaching fractions, judicious application rates for freshwater sources relative to effluent would contribute to the compatibility of these two approaches. In addition, recent innovations in salinity management call for the achievement of highly concentrated drainage waters, which favor the precipitation of salts out of the percolating solution. This concept closely corresponds with the recommendation that drainage volumes be minimized.

To avoid potential hazards to domestic water supplies on farms, several precautions should be observed: 1) damaged or abandoned wells should be repaired or sealed; 2) effluent should not be applied in areas directly adjacent to domestic supply wells, and effluent irrigation sites should be maintained at maximum possible distances from domestic supply wells; 3) periodic analysis of domestic water supplies for pathogenic or toxic indicators should be performed; 4) new wells should be constructed to tap only deeper aquifers, preferably below the confining clay layer, or the "E-clay"; and 5) the city should implement an annual groundwater monitoring program at effluent application sites, with analyses for nitrates, selected heavy metals, and pathogens.

Chapter 9

PUBLIC HEALTH CONCERNS REGARDING IRRIGATION REUSE OF WASTEWATER

Introduction

Public health concerns involving the project alternatives currently under consideration are focused on the irrigation reuse alternatives. Minimum treatment and disinfection requirements of the California Department of Health Services are identified in Table 9-1. The Department of Health Services initially expressed opposition to effluent reuse in the WSID (Redlin, pers. comm.). Subsequent to publication of the Draft EIS, the department has indicated tentative acceptance of reuse in the WSID under the following conditions: a) appropriate disinfection criteria (Table 9-1) must be met; and b) the city must submit more detailed information demonstrating the reliability of disinfection procedures or the ability of WSID to completely segregate effluent from other irrigation water sources so that crops receiving effluent can be strictly controlled.

Potential Bacterial or Viral Problems

The following discussion on potential bacterial or viral problems was excerpted in part from the Subsequent Draft EIR (by J. B. Gilbert & Associates, 1978) on the effluent disposal portions of the proposed project.

"The fate of bacterial and viral pathogens is difficult to generalize about due to the dynamic nature of the soil.

> "Bacteria. Removal of remaining bacteria from disinfected effluent occurs largely at the soil surface as a result of physical removal by entrapment, sedimentation, and adsorption. Maximum survival of bacterial pathogens in soil in most instances would be limited to less than 60 to 90 days in temperate climates (Gerba, et al., 1975). There are many factors which affect the survival of enteric bacteria in the soil including the following (Gerba, et al., 1975):
>
> - Moisture Content - Greater survival time, moist soils, and during times of high rainfall.
> - Moisture Holding Capacity - Survival time is less in sandy soils with greater water-holding capacity.
> - Temperature - Longer survival at low temperatures.
> - pH - Shorter survival in acid soils than alkaline soils.
> - Sunlight - Shorter survival time at soil surface.
> - Antagonisms from Soil Microflora - Increased survival in sterile soil.

Table 9-1

MINIMUM TREATMENT AND DISINFECTION REQUIREMENTS
FOR WASTEWATER REUSE

Use	Irrigation Method	Minimum Treatment Level	Minimum Disinfection Level
Fodder, fiber and seed crops	Surface or spray	Primary	None set
Orchard and vineyard crops harvested in a manner preventing contact of fruit with ground or irrigation water	Surface		
Milking animal pasture Landscape irrigation Landscape impoundments	Surface or Spray	Secondary	At some point during treatment, the median number of coliform organisms for the last 7 days shall not exceed 23/100 ml.
Food crops	Surface	Secondary	At some point during treatment, the median number of coliform organisms for the last 7 days shall not exceed 2.2/100 ml.
Restricted recreational impoundments (hunting, fishing and other activities not involving water contact)			
Food crops	Spray	Secondary plus coagulation, clarification and filtration	At some point during treatment, the median number of coliform organisms for the last 7 days shall not exceed 2.2/100 ml; and during any 30-day period, the number of coliform organisms in individual samples shall not exceed 23/100 ml more than once.
Nonrestricted recreational impoundments (no limitations on water sports)			

NOTES: The California Department of Health Services can modify these requirements for food crops which undergo extensive commercial processing prior to consumption. The Department of Health Services also sets requirements for treatment reliability and wastewater sampling procedures.

SOURCES: California Administrative Code, Title 22, Division 4, Chapter 3.

"If bacteria should by chance gain entrance to the underground aquifer, they can travel distances of several hundred feet. Under normal circumstances, relatively large numbers of bacteria are removed by percolation of treated effluent through a few feet of soil.

"Previous California studies on use of secondary effluents for irrigation have shown that after application, the MPN of coliform organisms on plant foliage surfaces ranged from 1 to 24 per square centimeter (SWRCB, 1954). Soil studies indicated that the surface soils had an MPN less than 5,000 Cm^3 and that soil from 2 1/2 feet had an MPN of about $100/Cm^3$. In 50 percent of the cases studied, coliform organism removals of greater than 99 percent occurred as the effluent percolated through the top 2 feet of soil.

"If crops are contaminated for any reason, such as if inadequate disinfection were to occur, pathogens and bacteria reaching the crops could survive for weeks (Table 9-2). As indicated, the survival times can be extended, particularly on root crops. For this reason, adequate disinfection must be provided at all times so that State Health Department reclamation criteria are continually met for each designated use of effluent.

"Viruses. There are a number of diseases associated with human enteric viruses which can be transmitted through improper wastewater management practices (Table 9-3). The fate of viruses in effluents applied to the land via disposal or irrigation has been the subject of numerous studies (Table 9-4). Results of studies in 1974 of the Flushing Meadows Wastewater Renovation Project near Phoenix, Arizona (high rate infiltration [328 feet/year] groundwater recharge operation started in 1967) indicated that human viral pathogens do not move through the soil into groundwater (Gilbert, et al., 1976). Viruses were apparently absorbed by and degraded by the soil by a factor of at least 10^4 (99.99 percent removal).

"Another study in St. Petersburg, Florida's sandy soils using spray-irrigated activated sludge effluent showed viruses can and do survive percolation through the soil (Wellings, F. M., 1975). One of the researcher's conclusions was the following:

> 'Since each virus PFU has the potential for causing disease in man, secondary wastewater spray irrigation of sandy soils should be recognized as one of the hazards of wastewater spray irrigation.'

Table 9-2

PATHOGEN AND TOTAL COLIFORM SURVIVAL ON CONTAMINATED FARM PRODUCE AND FODDER

Organism	Produce or Fodder	Survival Time (days)
Salmonella	Fodder	12-<42
	Root crops	10-53
	Leaf vegetables	1-40
	Berries	0.25-5
	Orchard crops	0.75-<2
Shigella	Fodder	<2
	Leaf vegetables	2-7
	Orchard crops	6
Enterovirus	Root crops	15-60
	Leaf vegetables	15-60
Ascaris eggs	Leaf vegetables	27-35
Entamoeba histolytica	Leaf vegetables	2
Total coliforms	Fodder	12-34
	Leaf vegetables	35

SOURCE: D'Itri, Kristensen and Bonde, 1977
(after Geldreich and Bonde, 1971)
as presented in J. B. Gilbert, 1978.

Table 9-3

DISEASES ASSOCIATED WITH HUMAN ENTERIC VIRUSES

Virus Subgroup	Number of Types	Disease
Poliovirus	3	Paralytic poliomyelitis, aseptic meningitis
Coxsackie virus		
Group A	24	Herpangina, aseptic meningitis, paralysis pleurodynia, acute infantile myocarditis
Group B	6	
Echoviruses	33	Aseptic meningitis, rash and fever, diarrheal disease, respiratory illnesses
Infectious hepatitis	1(?)*	Infectious hepatitis
Reovirus	3	Fever, respiratory infections, diarrhea
Adenovirus	31	Respiratory and eye infections

SOURCE: Cooper, 1974 as presented in J. B. Gilbert, 1978.

*The infectious agent responsible for infectious hepatitis has not been isolated and man is the only host, thus making experimental work extremely difficult.

Table 9-4

PENETRATION OR REMOVAL OF MICROORGANISMS THROUGH SOIL

Organism	Type of Study	Soil Type	Removal/Penetration	Reference
Coliform	Lab.	Saturated Sand	Penetration <10 ft at flow rates of 9-24 cm/day	Roebeck, 1961
E. coli	Lab.	Garden Soil	75% removal through 3 ft column	Gilcreas and Kelly, 1955
Poliovirus	Lab.	Saturated Sand	90-99.96% removal through 2 ft of sand after 42-105 days. Same removal rate at end of 6 months	Roebeck, 1961
Coxsackie & Thielers Virus	Lab.	Garden Soil	50% removal through 3 ft soil column	Gilcreas and Kelly, 1955
Bacteriophage	Lab.	Various Soils	90-95% removal within 1.5-1.6 ft of soil column	Drewry and Eliassen, 1968
Coliform	Field	Surface Spreading of 2nd Effluent	60% removal at 3 ft depth in 12 days. 100% removal at 6.5 ft	Arnold, et al., 1968
Coliform	Field	Surface Spreading of 2nd Effluent	95% removal at 6.5 ft	Stone and Garber, 1951
E. coli	Field	Surface Spreading	Penetrate to 10 ft but not to 20 ft	Baars, 1957
Coliform	Field	Surface Spreading Sandy Loam	Penetration to 2 ft between 3rd and 8th month. >90% removal	Gottas, 1953
Coliform	Field	Surface Spreading	90% removal at 2 ft depth	Bouwer, et al., 1974

SOURCE: J. B. Gilbert, 1978.

"Another study showed that clayey soils, similar to those in the study area display much better viral removals. Gerba, et al., 1975, in studies of the fate of viruses in soils concluded the following:

> 'Removal of viruses by soil occurs largely by adsorption. Salt concentration, pH, the presence of organic matter, soil composition, and flow rates may affect the degree of retention of viruses by soil particles. Recent work indicates that retention of viruses by soil particles does not result in their permanent immobilization from the liquid phase, and changes in water quality can result in their deadsorption and further subsurface travel.'

"The factors which may influence viral removal efficiencies by soil include:

- Flow Rate - Higher flows result in less viral retention.
- Cations - Can act to neutralize or reduce electrostatic potential between negatively charged virus and soil particles, allowing adsorption to proceed.
- Clays - High virus retention due to high CEC and large surface area per volume.
- Soluble Organics - Compete for adsorption sites on particles resulting in decreased adsorption or elution of an already adsorbed virus.
- pH - Generally a low pH favors virus adsorption while a high pH results in elution of adsorbed virus.
- Chemical Composition of the Soil - Certain metal complexes such as magnetic iron oxide have been found to readily adsorb viruses to their surfaces.

"Given the high degree of disinfection proposed (MPN of 2.2 to 23/100 ml) combined with the low rate of application to relatively high clay content soils (good virus adsorption), the risk associated with viruses reaching groundwaters is very small and there should be no hazard to human or animal health associated with the proposed irrigation uses.

"Given the level of disinfection proposed, the risk to swimmers in irrigation canals will be negligible. The total coliform density of 1,000/100 ml has traditionally been used as a criteria for the acceptability of safety for recreational waters. One study prepared for EPA concluded that the total coliform or fecal coliform concentration in a water must be exceptionally high ($\sim 8 \times 10^5$ MPN/100 ml) before a significant level of risk (1 case in 100,000) of contracting a disease is faced by a recreationist" (Mechalas, et al., 1972).

Potential Insect or Other Disease Vector Problems

Mosquitos are the principal species subject to control for public health reasons. An estimated 75 percent of the mosquito problem in the Delta Vector Control District occurs in irrigated pastures (National Academy of Sciences, 1976).

The Modesto Mosquito Abatement District and Turlock Mosquito Abatement District currently conduct mosquito abatement programs at the City of Modesto Water Quality Control Plant and oxidation ponds. Each area is monitored on a regular basis, usually ranging from a week to 10 days. At this time the areas are checked for recent mosquito infestations. If spraying is needed, as indicated by inspection, the area is generally treated with an oil spray.

The proposed land application of wastewater heretofore released to the San Joaquin River could create some problems if it is not treated properly. The California Department of Health, Vector and Waste Management Section recommends the following criteria for mosquito prevention in wastewater reclamation projects (California Department of Health, 1978b).

Criteria For Reuse Sites

1. All sites designated for wastewater reclamation or final disposal (cropland, marshes, etc.) should either be graded or ditched as necessary for proper drainage.
2. Sites for temporary impoundments used for waterfowl feeding areas or for production of food should be flooded according to time intervals and seasonal schedules adjusted to prevent the emergence of adult mosquitos. Contact the local mosquito control agency or the Vector and Waste Management Section, State Department of Health, for specific details.
3. The use of wastewater in crop irrigation requires careful land preparation and judicious water management to prevent excess static water areas.
4. Establishment of wetland habitat requires areas of deep water (4 feet); land grading or ditching to allow removal of all water from the shallow areas; water control structures, pumps, etc., for complete water management and access provisions for marsh management equipment such as boats and aquatic or terrain vehicles.
5. Excess water at the low ends of sites used for marsh flooding or crop irrigation must be either recycled, utilizing a return system, or disposed of in a drainage facility.

6. Water control devices such as pumps, weirs, and flood gates should be of proper capacity to draw down the temporary impoundments within a time designated by local mosquito control agency or the Vector and Waste Management Section, State Department of Health. Generally a 24-hour draw down period is sufficient for most areas of the state.

Criteria For Storage Ponds

1. Ponds may be any shape but should not have small coves or irregularities around their perimeters.
2. Ponds should be designed to be emptied by gravity or pumping for cleaning or drying and have graded bottoms so all water can be removed.
3. Side slopes of excavations and levees should be as steep as possible, consistent with soil characteristics and risk factors.
4. Where steep side slopes cannot be economically achieved, the slopes should be lined with suitable material such as concrete to 3 feet below the water line or sterilized to achieve weed control.
5. Minimum top width of embankments should be 12 feet and adequately constructed to support maintenance vehicular traffic.
6. An access ramp should be provided on an inside slope for launching a small boat for midge control.
7. Ponds designed for long-term storage should have a minimum storage depth of 4 feet.
8. A maintenance program for weed and erosion control along inner slopes is essential.
9. All accumulations of dead algae, vegetation and debris should be routinely removed from the impounded water surface and properly disposed of.

Criteria For Conveyance Facilities

1. Ditches must be maintained free of emergent, marginal and floating vegetation.
2. Ditches should be sized and graded for adequate flow and must not be used for water storage.
3. Unpressurized and low pressure pipelines, commonly used in irrigation distribution systems, should be designed to be emptied when not in use and should not be used for water storage because of the mosquito breeding potential in the partially filled pipes.

Implementation of some of the criteria listed above may have adverse impacts on wildlife and wildlife habitat, particularly at the oxidation pond site where the giant garter snake (considered to be rare by the California Department of Fish and Game) may occur. Consequently, the benefits received through mosquito control activities must be weighed against the resultant adverse impacts on wildlife species.

Chapter 10

IMPACTS ON THE SAN JOAQUIN RIVER ECOSYSTEM

The proposed project would involve a change in effluent disposal practices. Instead of the present situation of continuous effluent discharge to the San Joaquin River, effluent would be stored and used for agricultural irrigation. To reduce the size and cost of new storage ponds, the city is proposing to institute a program of intermittent winter discharges to the San Joaquin River. Whenever suspended solids levels indicate that discharge requirements would be met, effluent would be discharged at a rate of 70 MGD (108.3 cubic feet per second [cfs]). The 1979 project report supplement estimates that such discharges would take place on at least 21 days during the winter months. The 1979 project report supplement also recommends that the city construct a 2 MGD sand filtration system which would allow continuous, low volume discharges. The highest discharge rate under present conditions occurs during October. During 1974-76 October discharges averaged 30 MGD (46.4 cfs). Winter discharges (November-February) averaged 13.3 MGD (20.6 cfs) during these years. Table 10-1 summarizes monthly inflow and discharge rates for 1974-1976, together with the project report projections for 1987. Table 10-2 summarizes recent monthly and annual stream flows for several gauging stations on the San Jaoquin, Stanislaus, Tuolumne, and Merced Rivers.

Changes in San Joaquin River Flows

The 1,418 MG (million gallons) of effluent which the project report supplement proposes for winter discharge represents 24.9 percent of the total 1976 discharge to the San Joaquin River. This amount is 18.9 percent of the projected 1989 effluent volume requiring disposal. As outlined in the project report supplement and 1978 supplemental EIR, the anticipated January discharge will be almost twice the current total January discharge volume. Anticipated December and February discharge volumes would be about equal to current total discharges for those months. Under the proposed intermittent discharge program, however, these volumes would be released in only a few days during each month. The supplemental EIR (J. B. Gilbert, 1978) estimates there would normally be 6 discharge days during the months of December and February, and 9 discharge days during January.

Table 10-1

MONTHLY INFLOW AND OUTFLOW, MODESTO OXIDATION PONDS
(MGD)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1974													
Inflow	13.6	13.4	14.3	14.3	14.2	15.5	21.7	35.6	38.3	23.6	15.8	15.6	19.6
Outflow	11.7	10.3	12.1	10.8	8.7	10.2	13.2	18.5	24.2	31.2	15.0	13.5	15.0
1975													
Inflow	14.1	14.1	15.1	16.1	16.1	15.1	22.4	35.3	36.7	25.5	12.9	12.7	19.7
Outflow	10.1	12.8	13.7	14.8	9.7	8.2	19.9	22.9	19.1	32.3	18.3	13.5	16.3
1976													
Inflow	12.6	13.1	14.5	14.3	14.8	15.2	18.0	35.2	33.3	21.6	16.5	15.7	18.7
Outflow	9.9	16.6	13.1	10.3	10.9	14.7	12.1	23.5	22.4	26.5	15.6	12.6	15.6
Average													
Inflow	13.4	13.5	14.6	14.9	15.0	15.3	20.7	35.4	36.1	23.6	15.1	14.7	19.4
Outflow	10.6	13.2	13.0	12.0	9.8	11.0	15.1	21.6	21.9	30.0	16.3	13.2	15.6
1987 (Projected)													
Inflow	18.1	18.2	19.5	20.7	20.5	19.1	27.8	43.8	45.5	31.7	16.6	16.4	24.9
Outflow	17.8	17.6	15.9	14.5	12.6	9.2	18.3	35.8	38.8	27.0	15.4	16.2	19.9

SOURCE: H. Esmaili and Associates.

Table 10-2

MEAN MONTHLY AND ANNUAL FLOWS FOR 1975 AND 1976 WATER YEARS (cfs)

River	Station	Water year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg.
San Joaquin River	Vernalis	1975	3497	3891	4162	3766	6212	5685	3957	3972	5708	1718	1680	2652	3888
		1976	4543	3906	3745	3326	2115	1823	1293	939	798	671	1055	1067	2110
Stanislaus River	Ripon	1975	381	465	999	187	1486	1536	1033	2276	3473	398	289	307	1063
		1976	848	685	371	324	154	162	126	95.5	79.6	61.2	77.5	88.5	257
San Joaquin River	Maze Road	1975	3020	3380	2990	3460	5070	4370	2990	1970	2430	1220	1350	2450	2870
		1976	3869	3218	3290	2763	1832	1682	1221	863	755	672	1000	1104	1859
Tuolumne River	Tuolumne City	1975	1830	1910	1869	2570	2120	1820	727	584	442	345	359	836	1280
		1976	1302	1490	1266	1196	953	1290	651	561	376	316	245	290	839
Tuolumne River	Modesto	1975	1969	1935	1800	2733	2013	1711	651	535	328	316	314	799	1256
		1976	1927	1903	2296	1898	735	775	352	207	174	162	177	206	905
San Joaquin River	Patterson Bridge	1975	964	1225	1124	992	2735	2209	2100	1300	2167	899	959	1425	1496
		1976	1672	983	819	677	772	750	742	612	569	496	702	738	797
San Joaquin River	Newman	1975	709	1097	1058	881	2704	2113	1757	972	1858	564	643	1146	1278
		1976	1339	852	752	698	658	563	515	330	319	219	424	460	594
Merced River	Stevinson	1975	411	668	627	513	1203	891	924	618	1775	260	283	774	736
		1976	974	496	510	372	222	222	225	149	124	93.8	161	161	310
San Joaquin River	Fremont Ford	1975	179	221	236	184	1256	1055	664	278	212	188	295	356	421
		1976	266	197	132	137	228	187	180	112	155	125	240	219	182

SOURCE: H. Esmaili and Associates.

The proposed project would reduce San Joaquin River flows during most of the year. The available data show that effluent discharges currently represent less than 2 percent of the annual stream flow at Patterson Bridge during a normal year, and slightly more than 3 percent of the annual flow during a dry year (Table 10-3). On a monthly basis, the current discharges represent from less than 1 percent to more than 5 percent of the flows measured at Patterson Bridge. Pond discharges appear to be most significant in terms of river flows during the fall. Since much of the effluent used for irrigation will be replacing, rather than supplementing, current irrigation water sources, there will be little increase in downstream irrigation return flows.

Average monthly flows for the winter (November-February) of 1975-76 can be used to judge the significance of proposed winter discharges under dry year conditions. The 70 MGD discharge rate represents 11.0-16.0 percent of the monthly average flows at Patterson Bridge. During more normal years, such as the 1974-75 year, the 70 MGD rate would represent 4.0-10.9 percent of the average Patterson Bridge flows. Given the daily variations in river flows, the winter discharges will on occasion contribute both higher and lower proportions of San Joaquin River flows. The intermittent discharge program will thus increase the variability of San Joaquin River flows during the winter.

Impacts on Water Quality in the San Joaquin River

The segment of the San Joaquin River between Fremont Ford and Vernalis has been designated by the State Water Resources Control Board (1975) as a "water quality limited" stream segment. Water quality problems involve high TDS (total dissolved solids) levels, low dissolved oxygen levels, and summer nutrient levels which stimulate algal blooms. As indicated in Chapter 2, the present discharge from the Modesto oxidation ponds contributes to these and other water quality problems in the lower San Joaquin River. Concerns relate to suspended solids, BOD, nutrient, TDS, and toxicity loads added by the discharge.

To provide insight into the water quality effects of removing most of the present discharge, a modeling study was performed by Hydroscience, Inc. (Appendix H). This study attempted to identify the historical impact of the city's effluent discharge based on water quality surveys of the San Joaquin River conducted in 1976. Two time periods, July and September, were selected for analysis. River flows during the July 1976 survey were about 40 percent

Table 10-3

SIGNIFICANCE OF OXIDATION POND DISCHARGES DURING A NORMAL (1974/75) AND A DRY (1975/76) WATER YEAR

Gauging Station	Water Year	Pond Discharge as % of San Joaquin River Flows												Average for Water Year
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	
Patterson Bridge	1974/75	5.01	1.89	1.86	1.58	0.72	0.96	1.09	1.15	0.59	3.42	3.69	2.07	1.65
	1975/76	2.99	2.88	2.55	2.26	3.33	2.70	2.15	2.75	4.00	3.77	5.18	4.70	3.20
Maze Road	1974/75	0.49	0.77	0.76	0.52	2.52	1.60	0.69	0.70	0.45	0.39	2.62	1.21	0.86
	1975/76	1.29	0.88	0.63	0.55	1.40	1.21	1.31	1.95	3.01	2.79	3.64	3.14	1.37

NOTES:

Patterson Bridge gauging station is about 2 1/2 stream miles above the oxidation pond discharge.

Maze Road gauging station is below the confluence of the Tuolumne and San Joaquin Rivers, about 18 stream miles below the oxidation pond discharge.

SOURCE: Derived from data in Tables 10-1 and 10-2 of normal, while flows during the September 1976 survey were about 80 percent of normal. The city's effluent discharge during the July 1976 survey was 65 percent of the average for that month during the 1974-76 period. Effluent discharges during the September 1976 survey period were about 145 percent of the 1974-76 average September discharge. Thus, the survey period represented relatively dry year (but not highly unusual) flow conditions.

The results of the Hydroscience modeling study are summarized in Table 10-4. Under summer flow and discharge conditions (July), the city's effluent exerted only minor effects on BOD and algal levels in the river. During the fall period (September), the effluent added slightly to the TDS concentration (as indicated by conductivity) and substantially to the BOD, algal, and ammonia levels in the river. The modeling studies also showed that much of the BOD load exerted by the effluent was attributable to the death and decomposition of algae contained in the effluent. Thus, eliminating the current year-round discharge will have little effect on water quality in the river during the summer; significant reductions in BOD, algal and nitrogen levels should be noted during the fall.

Impacts on Fish and Wildlife

Historically, the San Joaquin River supported large salmon and steelhead populations; however, subsequent impoundments have eliminated the steelhead population and significantly reduced the salmon population. Remaining salmon populations spawn in the various tributaries to the San Joaquin River, with upstream spawning runs generally beginning in August and continuing through December. During the spring, young salmon migrate back downstream to the ocean.

A variety of warmwater game and nongame species inhabit the San Joaquin River. The principal game species, introduced into the San Joaquin River from the eastern U. S., include the white catfish, brown bullhead, channel catfish, largemouth bass, black crappie and bluegill. Nongame species inhabiting the river are all native with the exception of carp. The Sacramento blacktail, Sacramento squawfish, and Sacramento hitch are all nongame species which inhabit the San Joaquin River. The thicktail chub, considered endangered by the California Department of Fish and Game, was at one time found throughout the Sacramento and San Joaquin Valleys. No specimens have been identified since 1957, and may now be extinct (California Department of Fish and Game, 1978).

Table 10-4

SUMMARY OF MODELING RESULTS

PARAMETER	EXPECTED CHANGE IN RIVER CONCENTRATION DUE TO REMOVAL OF MODESTO EFFLUENT			
	July 1976 Conditions		September 1976 Conditions	
	Above Tuolumne* River	Near Vernalis+	Above Tuolumne* River	Near Vernalis+
Electrical Conductivity (µmhos/cm)	0	0	-50. (-6%)	-50. (-6%)
5-day Biochemical Oxygen Demand (mg/1)	-0.4 (-4%)	-0.3 (-4%)	-11. (-71%)	-6.3 (-66%)
Chlorophyll a (µg/1)	+10. (+6%)	0	-20. (-36%)	-18. (-47%)
Ammonia-Nitrogen (mg/1)	0	0	-0.7 (-90%)	-0.4 (-90%)

* Approximately 11.5 miles downstream of pond discharge.
+ Approximately 25.5 miles downstream of pond discharge.

SOURCE: Appendix H.

The San Joaquin River has received extensive use for agricultural, industrial and domestic water supply. Spawning areas have been destroyed by the lack of spring flows in sufficient quantity to wash silts and sand from the gravel beds. During periods of low flow the water temperature of the river has often exceeded lethal temperatures of anadromous fishes.

The current discharge of effluent adds somewhat to river flows, as indicated by Table 10-3. But the beneficial aspect of providing additional water flow is at least occasionally offset by adverse effects on water quality. The major impacts of Modesto's effluent on fish populations probably involve reductions in dissolved oxygen levels (due to BOD loads) and toxicity from residual chlorine levels.

During 1977, average residual chlorine levels in Modesto's effluent were 0.6 mg/l, well above the discharge limit of 0.1 mg/l established by the Regional Water Quality Control Board. Based largely on a study by the National Academy of Sciences, EPA has recently published a compilation of water quality criteria intended to protect fish, other aquatic life, and recreational use of marine and fresh waters (U. S. EPA, 1976b). The residual chlorine limits recommended by EPA are 0.002 mg/l for salmonid fish and 0.01 mg/l for other freshwater and marine organisms. The EPA water quality criteria levels have been reviewed by the American Fisheries Society (Thurston, et al., 1979). The analysis of EPA's residual chlorine criteria concluded that some freshwater species are more sensitive to residual chlorine than are salmonids. A single criterion of 0.003-0.005 mg/l (measured by amperometric titration in conjunction with a polarograph) was recommended as appropriate to protect freshwater organisms from the effects of continuously chlorinated discharges. A criterion of 0.02 mg/l was suggested for marine organisms. These criteria indicate the city's current discharge exerts toxic effects on salmon even when thoroughly diluted by upstream flows, and may be exerting toxic effects on other fish species.

From a fisheries standpoint, eliminating the current year-round discharge would involve both beneficial and adverse impacts. Water quality conditions downstream from the oxidation ponds would improve, but this improvement would be achieved at the expense of reduced stream flows. The intermittent winter discharges will provide temporary flow increases in the river which may be valuable during dry years. But the potential for rather low dilutions (occasionally less than 10:1) would indicate potential problems with residual chlorine levels even if the current 0.1 mg/l discharge limit is maintained. Effluent BOD levels may also exert a significant effect on dissolved oxygen levels during low river flow periods. One question which remains unanswered is whether the cumulative fisheries impacts of the intermittent discharge program would be greater or less than that of a continuous discharge, which meets current discharge standards.

Removal of direct discharge will probably not have an immediate detectable impact on riparian vegetation and terrestrial wildlife, since stream flow reductions would generally be less than 5 percent. For both aquatic and terrestrial biota, however, habitat loss and degradation are typically due to numerous minor changes, none of which is significant in isolation, but which are significant on a cumulative basis.

Impacts of Continued River Discharge for Effluent Disposal

Impacts Under No-Project Conditions

Failure to undertake any facility improvements would result in a continuing discharge of effluent which regularly exceeds discharge requirements for BOD, suspended solids, residual chlorine, and bacterial levels, and which occasionally exceeds standards for oil and grease, pH and toxicity. Current impacts on river water quality and fisheries would be continued.

Impacts of Upgraded Secondary Treatment

The 1976 project report evaluated several alternatives for improving treatment levels so as to meet river discharge requirements. Compliance with the current discharge requirements for BOD and suspended solids should eliminate any significant impacts of the discharge on downstream oxygen levels. Improved dechlorination would reduce the chlorine toxicity problem associated with current discharges. Effluent discharges are expected to increase by about 40 percent over the next 20 years. Dechlorination to a 0.1 mg/l residual chlorine level would allow dilution (generally at least 20:1) to meet the EPA criteria for nonsalmonid fish. The criteria for salmonids, however, would normally be exceeded for an undetermined distance downstream from the discharge.

From a fisheries standpoint, the most favorable project alternative would involve upgraded secondary treatment, essentially total dechlorination, and continuous river discharge. This would also be the most expensive project alternative.

Impacts of Pipeline River Crossings

All of the distribution alternatives would require at least one river crossing. Alternatives A, B, C, D, and H would cross the San Joaquin River near Grayson Road. Alternative C would include a second crossing on the Tuolumne River from the end of Laird Road to the Ott property. Alternatives E and F would cross the Tuolumne River at the same general location. Alternative G would cross the Tuolumne approximately 1 mile downstream from the Laird Road crossing. All river crossings will be done during summer or early fall periods when river flows are low. River crossings will result in temporary adverse effects on aquatic biota. Fall spawning runs of anadromous fish species may also be affected. Species will be displaced from the area of equipment operations, and sedentary species or fish eggs could be destroyed. Sedimentation from excavation and river bottom disturbance will affect fish causing avoidance of silted waters and possible gill irritation. Insects which serve as food for fish will also be affected. Siltation will also cause smothering of fish eggs in downstream areas. Some warmwater game and nongame fishes which spawn during this period (e.g., smallmouth bass, largemouth bass, green sunfish, bluegill, fathead minnow and golden shiner) may be disrupted. All stream crossings will require appropriate permits from the California Department of Fish and Game, State Reclamation Board, and the U. S. Army Corps of Engineers. The Department of Fish and Game will review plans for all stream crossings and propose specific procedures and mitigation measures to protect fish and wildlife resources (Fish and Game Code Sections 1601 and 1603). The Corps of Engineers has developed a standard set of conditions for utility pipeline projects (see comment letter from the Corps of Engineers in Chapter 17).

Chapter 11

PROJECT IMPACTS ON VEGETATION AND WILDLIFE

Impacts of Effluent Storage Alternatives

Four alternatives have been developed to meet the need for increased effluent storage. All storage alternatives include the construction of a storage pond on a city-owned 100-acre site adjacent to the existing ponds, and intermittent winter discharge to the San Joaquin River. The distinguishing features of the four alternatives (Figures 11-1 through 11-4) are:

A. Purchase additional land and develop this into an additional storage pond.
B. Deepen and modify the existing oxidation ponds to increase the in-pond storage.
C. Develop the existing 100-acre site into a storage pond sufficiently deep to meet all additional storage needs.
D. Increase the effluent pumping capacity for increased intermittent winter discharge. This is the city's preferred alternative.

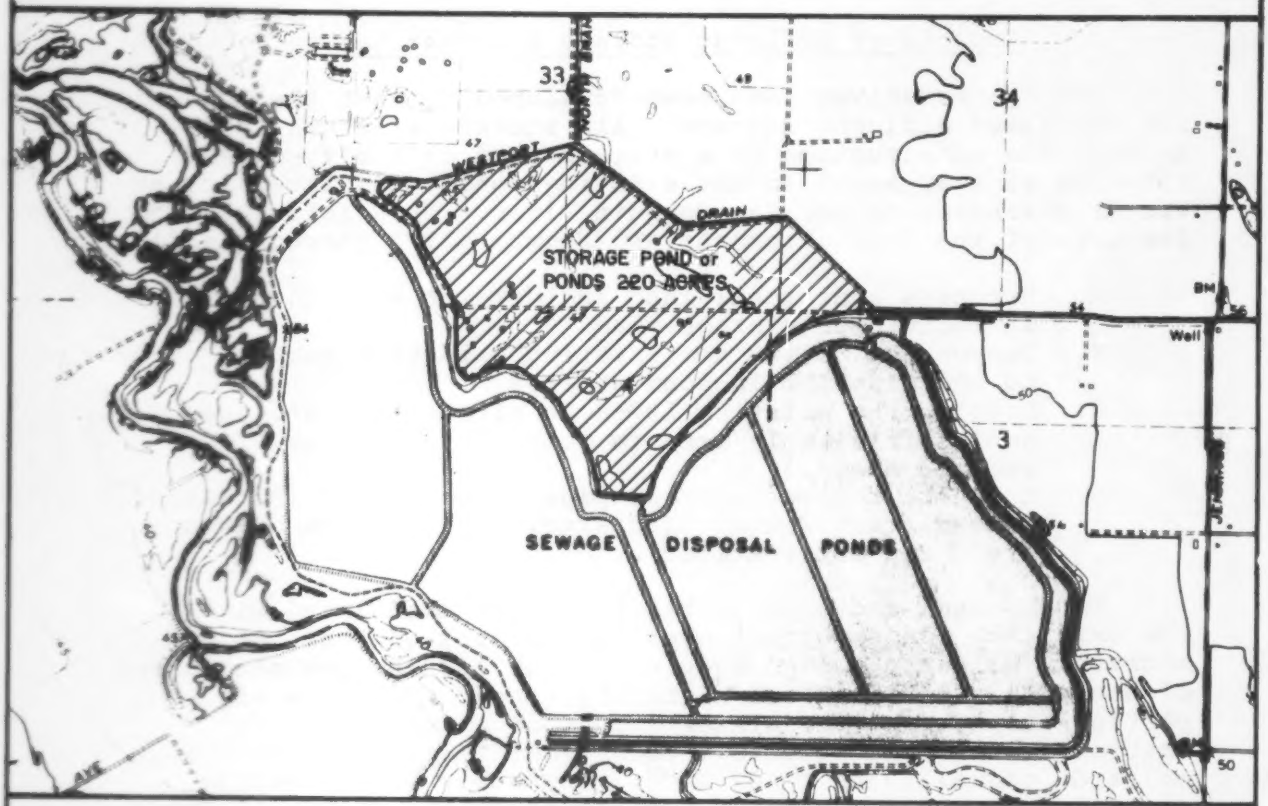
Terrestrial and aquatic habitat types associated with the oxidation ponds support over 100 species of resident and migratory wildlife. Bird species are by far the dominant users of the area. Resident and migratory waterfowl use is high, particularly during the winter when food availability is critical. Resident waterfowl found in the area include the mallard, gadwall, and ruddy duck. Migratory birds include the whistling swan, Canada goose, redhead, and pintail. Shorebirds such as the American avocet, black-necked stilt, great egret and great blue heron are commonly seen along streams and marsh areas on the site.

Shrub vegetation and adjacent cultivated lands provide suitable habitat for several upland game birds. The most important upland game species from an economic and recreational standpoint is the ring-necked pheasant. Mourning dove and California quail are also found in similar habitat in the study area. The proximity of food (grain fields), cover and water (storage ponds and peripheral drain) makes this area ideal for upland game species.

Small passerine species also utilize the grassland and shrub areas on the site as feeding grounds. The most evident users are the song sparrow, rufous-sided towhee and American goldfinch. Raptors and other predatory birds are particularly numerous in the grasslands and agricultural areas on the site.

FIGURE 11-1

STORAGE POND ALTERNATIVES

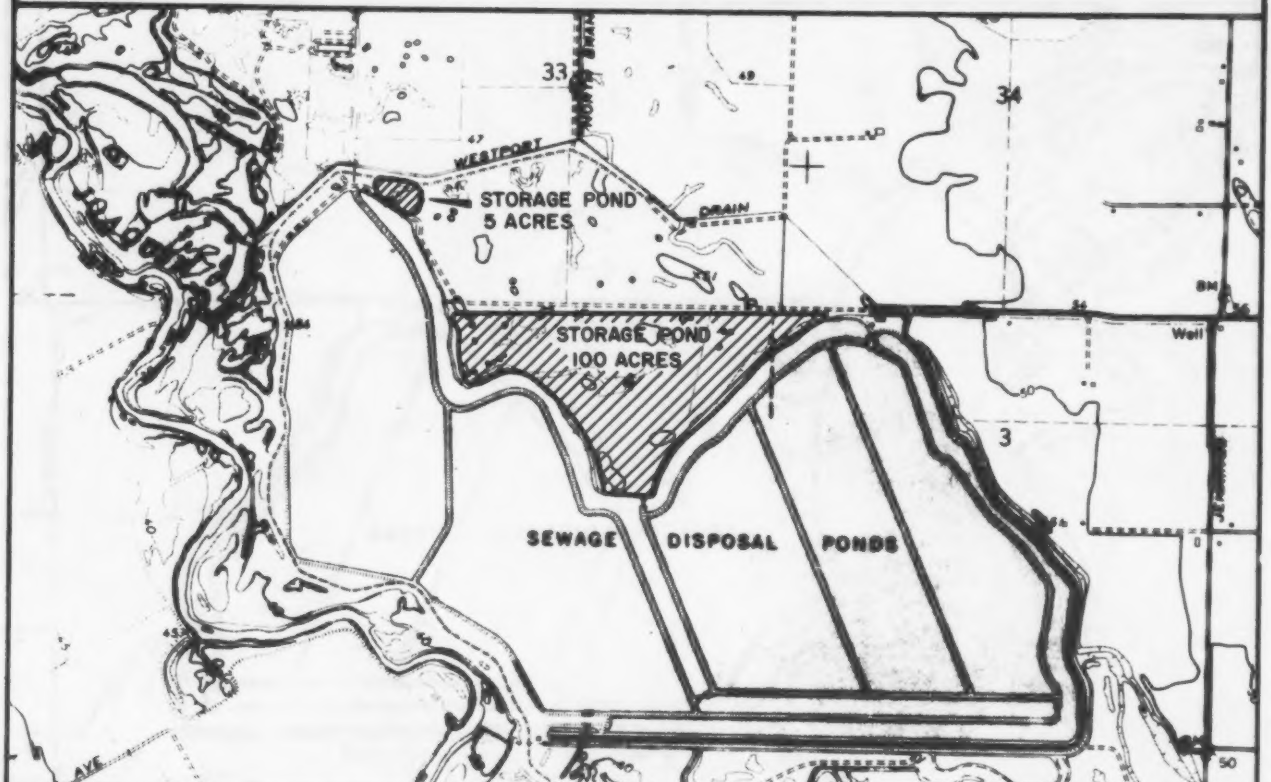

33
34
WESTPORT
DRAIN
STORAGE POND or PONDS 220 ACRES
SEWAGE DISPOSAL PONDS
3
Well
BM
47
49
50
AVE
N
0
2000'
FEET

STORAGE ALTERNATIVE A:
PURCHASE ADDITIONAL LAND

SOURCE: J.B. GILBERT & ASSOCIATES, 1978

FIGURE 11-2

STORAGE POND ALTERNATIVES

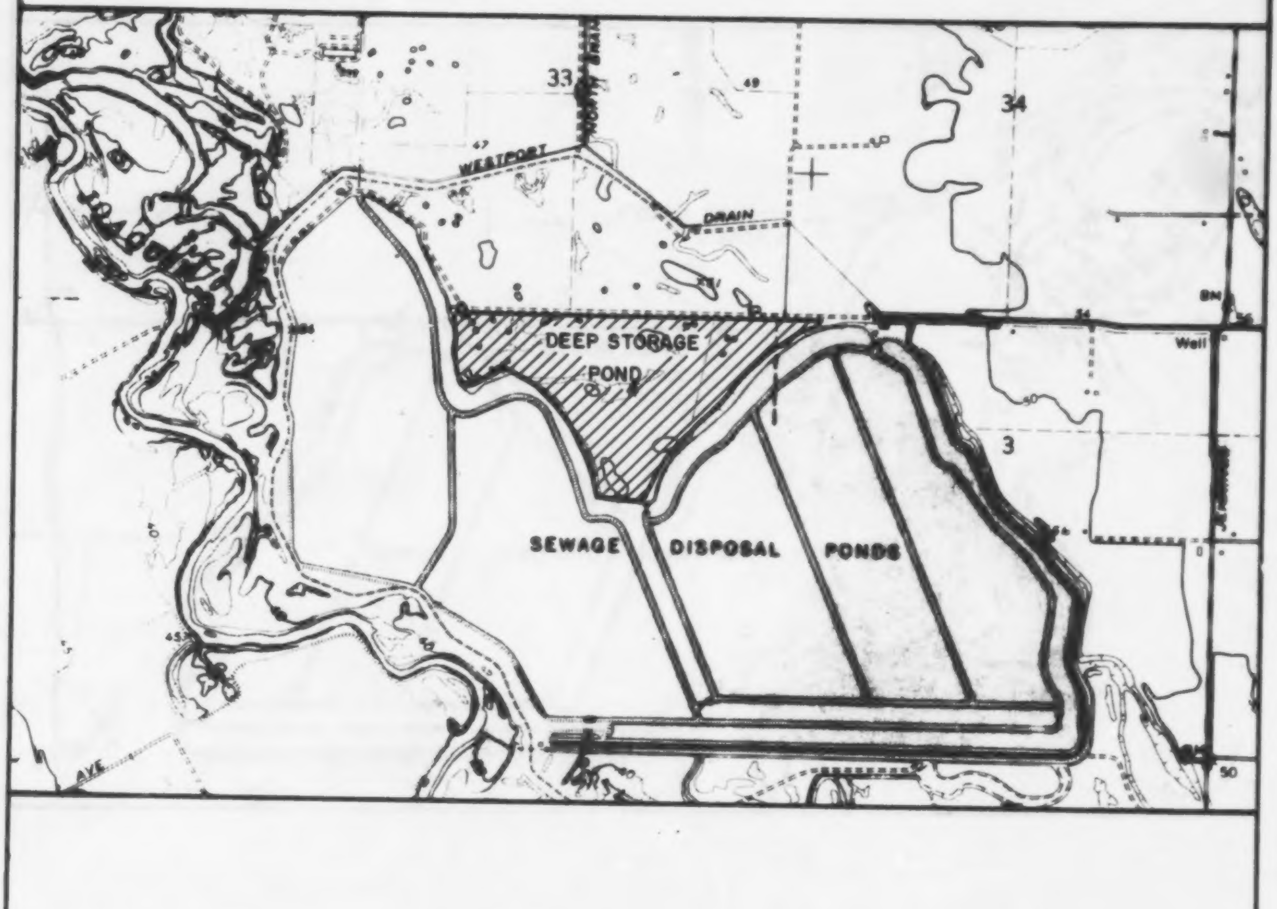

33
34
3
47
49
WESTPORT
STORAGE POND
5 ACRES
DRAIN
STORAGE POND
100 ACRES
SEWAGE DISPOSAL PONDS
Well
BM
50
AVE
N
0
2000'
FEET

STORAGE ALTERNATIVE B:
DEEPEN EXISTING PONDS

SOURCE: J.B. GILBERT & ASSOCIATES, 1978

FIGURE 11-3

STORAGE POND ALTERNATIVES


33
34
3
49
47
WESTPORT
DRAIN
Well
DEEP STORAGE POND
SEWAGE DISPOSAL PONDS
AVE
50

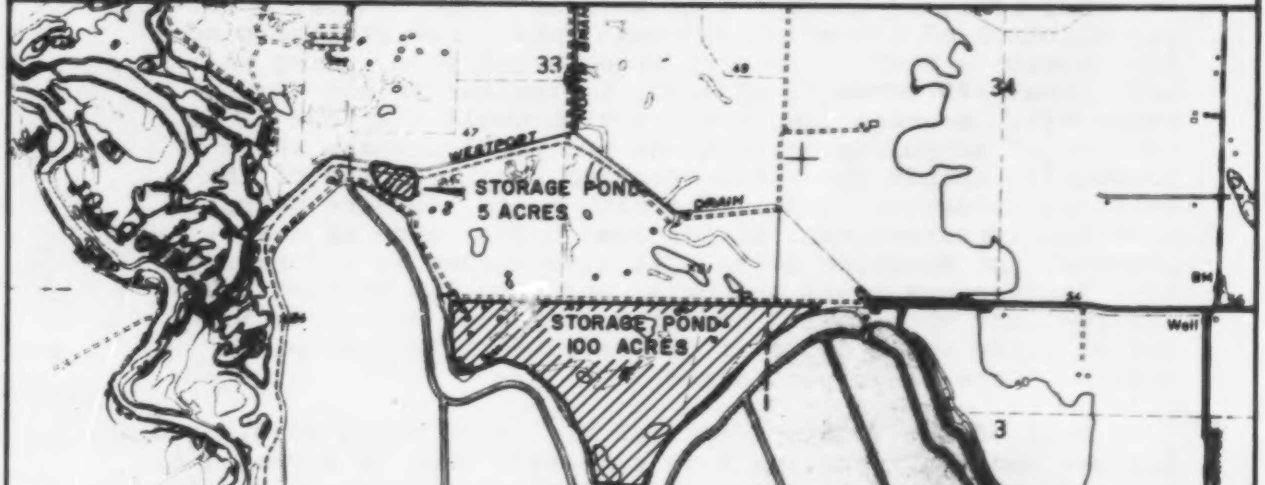
STORAGE ALTERNATIVE C:
DEEP STORAGE POND

N
0
2000'
FEET

SOURCE: J.B. GILBERT & ASSOCIATES, 1978

FIGURE 11-4

STORAGE POND ALTERNATIVES


33
34
3
47
49
WESTPORT
STORAGE POND
5 ACRES
DRAIN
STORAGE POND
100 ACRES
SEWAGE DISPOSAL PONDS
Well
AVE
50

E
0
2000'
FEET

STORAGE ALTERNATIVE D:
INCREASED WINTER DISCHARGE

SOURCE: J.B. GILBERT & ASSOCIATES, 1978

Raptors occurring in this area include the marsh hawk, cooper's hawk, American kestrel, great horned owl, and long-eared owl. These species feed on small insects, rodents and reptiles in the area while utilizing the denser vegetation along the river for cover and nesting.

All effluent storage alternatives would convert a 100-acre parcel north of the existing ponds into a new storage pond. Alternative A would create an even larger pond, using an additional 120 acres of adjacent agricultural land (Gomes property). Storage pond construction would displace a variety of songbirds, game birds and small mammals which presently inhabit the shrub/cropland habitat north of the existing oxidation ponds. The city-owned 100-acre parcel provides important habitat for game birds, such as quail, pheasant and mourning doves. It also serves as a foraging area for various hawks and owls, and provides nesting areas for resident waterfowl. Additional impacts on vegetation and wildlife could occur if excavated soil is stockpiled outside the storage pond areas.

Part of the adjacent agricultural area being considered for use under Alternative A is currently used as a pheasant hunting preserve. All storage pond alternatives could reduce the population of pheasants using this area by eliminating the breeding habitat and escape cover found on the city-owned site. Implementing Alternative A would completely eliminate the existing pheasant hunting area.

The decrease of suitable habitat which will result from pond construction will also cause a net decline in the local wildlife population. Animals displaced from construction areas may migrate out of the area entirely. Others will attempt to establish themselves in remaining local areas of suitable habitat. This will produce a short-term increase in population densities. In the absence of improved habitat conditions, increased mortality and/or reduced reproduction rates will eventually reduce these populations.

The creation of additional storage ponds will increase available resting areas for waterfowl. This will be most significant for flocks migrating through the area. But given the large existing pond acreage, increases in resident waterfowl numbers are unlikely. The associated loss of terrestrial nesting and feeding areas may reduce populations of some resident and migratory species.

Mitigation

Loss of wildlife habitat is an unavoidable impact of pond construction. Partial mitigation can only be achieved by undertaking habitat improvement projects on areas presently of marginal habitat value. In the vicinity of the oxidation pond site, this would probably require conversion of agricultural lands (cultivated or in pasture usage) to wildlife habitat uses. Thus, no mitigation is being recommended.

Impacts of Effluent Distribution Facilities

Irrigation reuse of treated effluent will require construction of a system of pipelines and pump stations. Probable pipeline corridors for eight alternative groups of irrigators have been identified in the 1978 project report supplement (see Figures 8-1 through 8-4). Precise pipeline alignments will not be established until contracts with effluent users are finalized. The most significant disturbance of wildlife habitat from pipeline construction is likely to occur in riparian areas along the San Joaquin and Tuolumne Rivers. Right-of-way clearing and construction activities may cause some animals to leave the construction area or modify their activity patterns. Until specific pipeline routes are planned, the significance of such disturbance and vegetation removal cannot be fully evaluated.

Pipeline construction will generate an amount of spoil approximately equal to the volume of the pipelines used. Depending on the irrigation alternative which is implemented, sufficient spoil will be generated to cover a 60- to 100-acre area to a 1-foot depth.

Commonly used methods of spoil disposal have a potential for producing a significant environmental impact. Agricultural landowners may be interested in obtaining clean fill dirt for reclamation of "lowlands" which are presently untillable. These "lowlands" are valuable or unique natural habitats such as marshes or vernal pools.

Another method of disposal available is the spreading of soil on fallow cropland. The spoil might also be sold to the Bonzi landfill, which acts as a broker for other large construction projects which may need fill material.

Distribution pipelines to the Wagler property and the West Stanislaus Irrigation District would pass near areas where the Delta coyote thistle (Eryngium racemosum), a plant species considered by the California Native Plant Society to be endangered, has previously been collected. This plant grows in freshwater marsh and other wet areas. Another plant which grows in similar types of areas, the slough thistle (Cirsium crassicaule), is being considered by the U. S. Department of the Interior for designation as an endangered species. This plant has not been recorded in Stanislaus County, but does occur along the San Joaquin River near the San Joaquin/Stanislaus county line. As long as pipeline routes follow roads and existing utility rights-of-way, there should be no major disturbance of any remaining populations of these plants. The potential for their presence in roadside drainage ditches, however, remains to be investigated.

To avoid disturbance of Aleutian Canada geese which winter on the Mapes Ranch (see below), any pipeline construction in that area should occur between the months of March and October.

Potential Impacts of Irrigation and Agricultural Changes on Vegetation and Wildlife

Treated effluent would be used at most irrigation areas as a substitute for currently utilized irrigation sources. Some irrigation areas, however, contain uncultivated areas that might be put into production. Most such uncultivated land is on the Mapes Ranch (Lyons property). Smaller acreages of uncultivated land are present on the Chase property and the Ott property. There may be additional uncultivated areas within the West Stanislaus Irrigation District, or in adjacent lands which could be annexed to the district.

The valley portions of Stanislaus County have been predominantly converted to agriculture with the exception of a few scattered oak woodland communities, marsh vegetation and riparian vegetation along the streams in the area.

Riparian habitat along the San Joaquin and Tuolumne Rivers consists of a dense tree canopy with an understory of shrubs and herbaceous vegetation. Species found here are adapted to moist soil conditions or grow with their root system submerged in the water table. Willows and cottonwoods are characteristic of riparian areas. Other common species found here include big-leaf maple, sycamore, dogwood, interior live oak and white alder. These larger trees provide nesting locations for some hawks, owls and other tree-nesting birds. The understory vegetation is generally of the shrub-type, consisting of elderberry, buttonbush and mugwort. Shrub vegetation provides ground cover for passerine birds, upland game and small mammals.

Recognizing the habitat characteristics of the area, four wildlife species identified as rare or endangered by federal and state agencies might be found on some of the potential irrigation areas -- the blunt-nosed leopard lizard (listed as endangered by both the U. S. Department of the Interior and California Department of Fish and Game), the San Joaquin kit fox (listed as endangered by the U. S. Department of the Interior and as rare by the California Department of Fish and Game), the Aleutian Canada goose (listed as endangered by U. S. Department of the Interior), and the giant garter snake (listed as rare by California Department of Fish and Game). Both the slough thistle and the Delta coyote thistle (discussed above in reference to the effluent distribution facilities) might also occur on some of the irrigation areas.

During May and August 1978 Jones and Stokes Associates conducted aerial and field surveys of proposed irrigation areas to determine whether a significant disturbance of vegetation and wildlife would occur within these areas. Areas that were in total cultivation during the aerial reconnaissance (Souza, Rogers, Gomes and Wagler properties) were not subsequently checked for disturbance of vegetation and wildlife. Ground surveys were made where large acreages of land had been left uncultivated (Chase and Lyon's property) or significant riparian vegetation passed through the area (Ott property).

Many of the plant species observed are typical of those found in an alkali sink community. Alkali sink vegetation included alkali heath (Frankenia grandifolia var. campestria), several atriplex species and salt grass (Distichilis spicata). Other less saline areas surveyed were found to contain scattered individual plant species commonly found in fresh and brackish water marshes. Characteristic species are cattail, common tule, sedge and brassbuttons. Dry areas were dominated by weedy species commonly found in disturbed habitats throughout the Central Valley (i.e., Russian thistle, star thistle, cocklebur and various grasses). No rare or endangered species were identified on any of the irrigation areas during these field surveys. These field surveys, however, were not sufficiently intensive to prove the absence of any endangered species.

The endangered Aleutian Canada goose nests on Buldir Island in the Aleutian Islands of Alaska. Their endangered status is largely attributed to the introduction of Arctic foxes on their nesting islands by Russian and American trappers. Bellrose (1976) reported about 98 percent of the Aleutian population wintered in California. Approximately 73 percent of these birds wintered in the Central Valley and utilized the irrigated pasture areas of the Faith and Mapes Ranches near Modesto (U. S. Fish and Wildlife Service, 1978a). Present efforts to restore population numbers include the removal of Arctic foxes from the nesting islands, protecting known staging and migration areas, propagation, and hunting closures.

The Faith Ranch, adjacent to the Mapes Ranch, has been identified as an important wintering area for the Central Valley population of the greater sandhill crane (U. S. Fish and Wildlife Service, 1978b). Like the Aleutian Canada goose, these birds use the pond and irrigated pasture areas of the Faith (and perhaps the Mapes) Ranch. The greater sandhill crane is not officially listed as a rare or endangered species; the Central Valley population, however, consists of only about 3,000 birds (U. S. Fish and Wildlife Service, 1978b).

The San Joaquin kit fox occurs along the foothills and uncultivated valley floor areas on the west side of the San Joaquin Valley as far north as Byron in Contra Costa County. The uncultivated areas of the Mapes Ranch appear to be suitable habitat, but aerial and field surveys did not detect any evidence of current use by kit foxes. The major source of habitat loss for the San Joaquin kit fox is conversion of uncultivated areas to irrigated agriculture (California Department of Fish and Game, 1978).

The endangered blunt-nosed leopard lizard was originally found in the San Joaquin Valley and adjacent foothills surrounding the valley. They now inhabit less than 50 percent of their former range in scattered locations where native vegetation has not been removed and in the eastern portion of the Coast Range foothills from Kern to Merced. No sightings of the blunt-nosed leopard lizard have been recorded north of Merced (Brode, pers. comm.). The habitat type preferred by this species occurs in Stanislaus County but its presence has not been verified.

The original range of the rare giant garter snake was from the vicinity of Sacramento and Antioch southward to Buena Vista Lake. The presently known distribution extends from the vicinity of Gridley, in Butte County, to Burrel, in Fresno County (California Department of Fish and Game, 1978). During a March 1978 field trip to the Modesto oxidation ponds, Ed Armstrong from the Department of Fish and Game observed what he believed to be a giant garter snake. This sighting was not verified. A subsequent check of the area was made by the department's herpetologist, John Brode, but no sightings of the giant garter snake resulted.

The conversion of uncultivated areas to cultivated crop production eliminates most or all native and naturalized vegetation from the affected area. Most associated wildlife is also eliminated by such conversions. The uncultivated lands of the Mapes Ranch are significant because of their importance to the Aleutain Canada goose population occurring here (U. S. Fish and Wildlife Service, 1978a). Based on available information, conversion of nonirrigated areas on the Mapes Ranch to irrigated pasture use will not have any adverse impact on the Aleutian Canada goose, and would probably increase the wintering habitat for this species.

While it appears that no rare or endangered species would be affected by conversion of uncultivated areas to agricultural use, populations of other species could be eliminated. Dr. Daniel F. Williams (California State College, Stanislaus) has noted that several rodent species are being eliminated from the county by conversion of natural grasslands to cultivated agriculture (SAAG, 1975). Dr. Williams cites the San Joaquin pocket mouse, little pocket mouse, Heerman's kangaroo rat, and the broad-handed mole as particular examples.

As noted in Chapter 8, the city's preferred irrigation reuse alternative involves reuse on the Chase and Gomes properties plus effluent distribution to the West Stanislaus Irrigation District. Irrigation reuse on these areas would have minimal impacts on vegetation and wildlife.

Chapter 12

IMPACTS OF SLUDGE PROCESSING AND DISPOSAL

Sludge Processing and Disposal Practices

Modesto's wastewater treatment plant generates approximately 2,000 cubic yards of dewatered sludge per year. This sludge consists predominantly of the organic solids precipitated from sewage wastewaters during the various treatment stages and is subjected to anaerobic digestion over a 30-day detention period, resulting in a reduction in sludge mass and in pathogen content. Subsequent steps in sludge treatment consist of thickening, centrifugation, and chemical coagulation followed by spreading in open beds for the dewatering process. After a dewatering period of approximately six months to a year, the sludge is scraped from the beds and hauled to agricultural sites where it is applied as a soil amendment.

The sludge hauling and land application procedures are conducted by private concerns under short-term agreements with the city. The current arrangement is with the Hager Supply Company, which distributes the sludge to farms outside of Stanislaus County (primarily in Tulare County) for use as a soil amendment. In past years, the sludge has also been applied to local vineyards owned by the Ernest and Julio Gallo Winery.

Without long-term contracts, a continuing market for sludge as a soil amendment is not guaranteed, and alternative sludge management procedures may be required. Although no federal or state regulations on the beneficial reuse of sludge are currently in force, new requirements are being developed by EPA and the State Department of Health. Such requirements may affect the agricultural marketing of Modesto sludge, by calling for more stringent controls over application rates, site selection, management practices and monitoring programs. Because the response of current sludge users to these controls cannot be anticipated, alternative sludge disposal practices should be considered to provide for a possible decline in use of the sludge.

A further uncertainty in sludge management involves the projected production of significantly higher volumes of sludge, due to the increased sewage inflow levels associated with Modesto's projected growth. An increase of 46 percent over current levels of sludge production is anticipated by

1990. Whether the demand for sludge as a soil amendment would be sufficient to absorb the added volume is uncertain. A more intensive marketing strategy may be required under those conditions. Alternatives to agricultural use could possibly include the application of sludge to dedicated municipally-owned land disposal sites, incineration, landfilling, or use by worm farms or other potential markets.

The proposed modifications to Modesto's treatment facilities do not involve any changes in sludge disposal practices. The environmental impacts of land application of Modesto's sludge are largely experienced at application sites. This section evaluates Modesto sludge in terms of its general suitability as a soil amendment and makes recommendations for measures to mitigate adverse environmental impacts associated with land application of this sludge. Specific environmental impacts vary according to site characteristics and can be rigorously analyzed only with regard to specific sites.

Potential Problems with Using Sludge as a Soil Conditioner

The utilization of sewage sludge as a soil conditioner and low-grade fertilizer can provide a resourceful and frequently cost-effective alternative to other sludge disposal techniques. In areas where sludge is of adequate quality to make land application an environmentally acceptable practice, this technique preserves the positive value of sewage sludge by conserving and recycling its plant nutrients. Furthermore, the organic matter in sludge combines with soil material, thus improving the soil's physical structure and nutritional properties. However, careful management and planning must be provided in order to minimize both short- and long-term risks to public health and to the environment. Because domestic and municipal sludges can transport trace elements, toxic organic substances, and certain pathogens which may have adverse impacts on public health or on ecosystems, a conservative approach is generally emphasized in developing land application practices.

Concerns over public health impacts of adding heavy metals and persistent organic compounds to agricultural soils are based on the increasing levels of these potentially toxic substances appearing in food, air, and water supplies. Although individual food products derived from sludge-treated sites are unlikely to contain in themselves sufficient concentrations of heavy metals or persistent organics to produce toxicity symptoms in consumers, for the general population the overall dietary intake of particular toxic substances may be approaching hazardous levels. For example, the World Health Organization of the United Nations has recommended that total cadmium intake from all sources be limited to 400 to 500 micrograms per week. The U. S. Food and Drug Administration (FDA) estimates that typical intake in the U. S. from dietary sources alone now approximates this value (FDA, 1975). Every effort should thus be made to halt further increases in cadmium intake. For this reason, regulations are being established to restrict cadmium loadings to soil from sludge applications in order to limit cadmium uptake by food crops grown on these sites. The same approach applies to other toxic metals such as lead, mercury, and nickel. Limitation on sludge application must also take account of the potential for soil contamination by elements toxic to plant growth, such as chromium, copper, nickel, and zinc. The behavior of trace substances in soil and their availability for crop uptake is highly dependent on soil conditions. Thus, plant uptake and consequent toxicity hazards can also be affected by the soil conditions at application sites.

Sludge Characteristics

After treatment and dewatering, Modesto's sludge somewhat resembles moist garden soil, with a generally inoffensive odor and a light crumbly texture. The 30-day period of anaerobic digestion and the six-month dewatering period act to reduce the numbers and viability of pathogenic organisms contained in the sludge. There is abundant evidence showing that pathogenic bacteria, viruses, protozoa, amoeba cysts, and helminth eggs are not always destroyed by anaerobic digestion (Burge and Marsh, 1978). Although the 6-month dewatering period occurring after digestion serves to further reduce the pathogen count, the finished sludge must nevertheless be considered as a potential source of infection. Pasteurization or composting of sludge could be practiced to lower the public health hazards associated with its pathogen content.

A representative sample of Modesto sludge was analyzed for major and trace elements and persistent organic residues (see Appendix G). Results show the concentrations of most inorganic constituents to be below mean values for other municipal sludges. Chromium, iron, magnesium and molybdenum, however, appear at levels matching or exceeding mean values for other municipal sludges. Among the chlorinated hydrocarbons analyzed, polychlorinated biphenyls (PCBs) were present at 1.32 ppm and pesticide residues appeared at 3.29 ppm. In addition, supplemental sludge sampling carried out by Jenks and Harrison revealed high levels of lead and strontium.

The significance of trace element concentrations in sludge pertains to 1) possible food chain accumulations of elements toxic to animals and humans, and 2) to plant responses to trace elements. A draft technical bulletin recently published by the State Department of Health (California Department of Health, 1978a) notes that ". . . the common amounts of chromium, selenium, and molybdenum present in biological wastes could have important beneficial effects on the food chain, while the presence of cadmium, mercury, nickel, PCBs, pathogenic organisms, and possibly antimony, beryllium, arsenic, vanadium, and germanium must be prevented from reaching hazardous levels within the food chain." This bulletin further cites lead, bismuth, tellurium, palladium, and persistent organic substances as sludge constituents which have potentially adverse impacts on public health. Sludge applications can also improve the trace element nutrition of plants by raising the concentrations of essential trace elements which are deficient in the soil at application sites.

Management Recommendations for Land Application of Sludge

The management of land application practices must be conducted with concern for potential environmental and public health impacts. The possibility of a gradual and long-term accumulation of toxic metals in soils and in food chains must be considered as well as the more immediate hazards of public exposure to pathogens in the sludge and deterioration of water quality resulting from runoff or deep percolation of nutrient-rich leachates. Control over these impacts can usually be achieved through careful site and crop selection and judicious rates of sludge application.

Site Selection

The criteria governing the selection of sites for sludge applications are generally directed toward minimizing the mobility of toxic elements, pathogens, and nutrients, either through deep percolation, runoff, or plant uptake. Sites should be sufficiently level for minimal surface runoff, preferably with a slope of less than 5 percent. Tailwaters from fields receiving surface sludge applications should be monitored for pathogens and toxic elements. Soils at application sites should possess a pH above 6.5, and be of moderate permeability. A high cation exchange capacity (CEC), and sufficient depth to allow for adequate filtration of percolating waters are also desirable properties for soils at application sites. Each of the above soil factors should be evaluated at potential application sites in order to develop appropriate application rates.

Crop Selection

Plant response to metal concentrations in soils varies widely with species and with soil characteristics. Yields may be affected by metal interference with respiratory, photosynthetic, and other metabolic mechanisms in the plant. The trace elements most commonly associated with phytotoxicity are copper, nickel, and zinc. Depending on the plant species, environmental conditions, and the metal ion in question, accumulation may occur in roots, leafy tissue, seeds, or fruits (Kirkham, 1977). However, leafy vegetables are generally considered to be more susceptible to metal accumulation than other types of edible plants.

Desirable plant characteristics would include resistance to phytotoxic effects caused by certain metals contained in the sludge, and the ability to exclude toxic trace elements from edible portions of the plant. Acceptable metal loadings on soils used for agricultural purposes are far more critical from a public health standpoint than for lands producing nonedible plants. However, the possibility that nonagricultural lands receiving sludge applications may eventually be converted to use for agriculture or for home gardens should also be a consideration for site selection and for determination of application rates.

Determination of Application Rates

The optimum rate for sludge application to agricultural soils must be determined on the basis of the concentration of its limiting constituents. This implies that the application rate must not exceed either 1) the maximum loading level considered safe for elements which accumulate in the soil, such as most trace elements, or 2) the assimilative capacity of the soil for a special element such as nitrogen.

Once a maximum loading level for any particular trace element has been attained at a site, sludge applications to that site must be discontinued. A 20-year site lifetime is commonly assumed as a base period for which maximum annual trace element loadings may be determined. Whether application rates for a particular sludge are limited by the concentration of nitrogen or by trace element levels depends on the chemical composition of the sludge and the projected site lifetime, as well as the site characteristics. Sludges containing a high level of a toxic trace element may require an application rate which would fall below an application rate based on the sludge nitrogen content, and vice versa.

Trace Element Loadings. Trace elements added to the soil through sludge applications can have either beneficial or detrimental effects on plants or on plant consumers, depending on the type and concentration of the element in question. Cadmium is currently receiving the greatest attention as a public health hazard associated with sludge application to land. However, high levels of other metals may also pose health risks to consumers of crops raised on sludge-treated soils.

According to estimated plant toxicity thresholds for zinc equivalent concentrations in Modesto sludge, the maximum allowable sludge application rate to crops for an assumed site lifetime of 20 years would fall between 0.7 and 2.43 dry tons per acre per year. The formulas used to calculate these application rates were derived from work by Chaney, Chumbley, and Keeney, as described by Garrigan (1977). Modifications in the formulation of zinc equivalent value were made to account for the presence of chromium and vanadium in Modesto sludge, due to the phytotoxicity of these elements. In this modification it was assumed that chromium and vanadium are at least as toxic as nickel to growing plants. A more detailed discussion of this topic is presented in Appendix G. The application rates cited above would also fall within acceptable limits for levels of cadmium loading to the soil. However, the apparent variability in the quality of Modesto sludge, the presence of a very high level of chromium, and the appearance in recently analyzed sludge samples of a high lead concentration all point to the need for further analysis prior to making a final determination of safe application rates.

Chromium and lead are singled out for their potential risk because their levels in Modesto sludge match or exceed maximum permissible concentrations set for sludges to be applied to agricultural land, as cited by Garrigan (1977), and FDA (EPA, 1977). The standards for maximum permissible levels of chromium and lead, as cited by Garrigan, range from 1,000 to 2,114 ppm for both elements. The FDA standard sets a maximum limit of 1,000 ppm for lead contained in sludges applied to cropland.

Nitrogen Loadings. One objective in applying sludge to land is to meet the nutrient demand of crops growing at the site and thereby to eliminate or reduce the need for fertilizer applications. The nitrogen content of sludge is the parameter most commonly used to determine sludge application rates for use as a fertilizer. Most nitrogen contained in sludge is in organic form. Organically-bound nitrogen must be converted into an inorganic form by soil microbes before it is available for plant uptake. This conversion, called mineralization, can proceed at different rates, depending on soil conditions.

If sludge is used as a complete nitrogen fertilizer substitute, the required application rates would generally exceed the allowable safe levels for preventing the build-up of phytotoxic elements in the soil. Therefore, trace element concentrations rather than nitrogen levels are concluded to be the limiting sludge constituents for determining the allowable application rates.

Supplemental Sludge Management Study

At the request of the EPA, Jenks and Harrison Engineers prepared a supplement to the City of Modesto Facilities Plan in September 1978. The purpose of this supplementary study was to address the issue of Modesto's sludge disposal practices, a topic which was not treated in detail in the 1976 Project Report.

This study points out that due to increased levels of sewage inflow, the annual quantity of dried sludge will increase by 46 percent over the current production level.

Two sludge samples were analyzed for this report and were compared with the analysis performed in January 1978, as part of the sludge management study conducted for the Modesto EIS. One sample was collected from the sludge-drying bed area and the other was collected from the anaerobic digester system. These two samples were assumed to be representative of sludge produced during different time periods, although the exact time of production was not known for the dried sample.

Chemical analysis of these two samples revealed trace element values which, with several exceptions, roughly corresponded to the values used for the application rate determinations discussed previously. However, chromium levels showed an increase of 50 percent from 1,750 ppm in the earlier sample to an average value of 2,550 ppm in the two supplemental samples. Lead levels increased from a low level of 16 ppm in the earlier sample to approximately 1,000 ppm in one sample, and 2,000 ppm in the second, indicating extreme variability in the concentration of this element in Modesto sludge. Cadmium levels were approximately three times higher than that obtained for the EIS study. However, these reported cadmium levels were not excessive within the context of the application rate analysis described above. Strontium was found in these samples to be present at a level of over 2,100 ppm, a concentration which indicates the presence of a significant industrial discharge source. This level, the equivalent of 2/10 of 1 percent of the sludge's total solids, exceeds the mean value for this element in municipal sludges by a factor of four, based on EPA data (1977). Because this element is not generally considered toxic to plants or animals, its rather high concentration in Modesto sludge would probably not affect application rate determinations. There were no significant decreases among any of the trace elements analyzed. No polychlorinated biphenyls (PCB's) were detected in these samples, whereas the concentration of these compounds was 1.32 ppm in the earlier sample.

The results of these analyses are in agreement with the conclusion expressed previously that trace element loadings should be the primary consideration in determining sludge application rates to agricultural soils. In addition, the presence of high lead concentrations in these samples indicates a potential public health hazard which was not considered in the previous analysis. Food and Drug Administration guidelines state that sludge containing lead at concentrations over 1,000 ppm should not be applied to land used for food or forage production.

The report briefly identifies the industries most likely to be discharging heavy metal wastes to the Modesto sewer system. If source control were to be implemented in order to lower the levels of heavy metals in sludge, a program for monitoring each industrial discharger's wastewater would probably be required. With regard to possible improvements in sludge quality, source control is, by far, cheaper than any treatment process for removing these metals from the sludge.

The most viable alternative to sludge disposal through agricultural reuse is identified as landfilling. Two landfill sites are currently in operation in Stanislaus County, although the suitability of one site for accepting sludge is uncertain due to high water table conditions and an expected completion date of 1985. The landfill disposal fee of $1.75 per ton would amount to an annual cost of under $6,000 with the current rate of sludge production.

Conclusions and Recommendations

The choice of a sludge management policy in Modesto will depend in part on pending regulations to be issued by pertinent regulatory agencies. In the absence of such regulations, sound environmental management practices should be followed in order to minimize impacts of sludge reuse. The high levels of chromium and lead as well as the presence of other metals in sludge samples indicate that trace element loadings must be considered when determining sludge application rates to soils. Furthermore, application sites should be evaulated to ensure their suitability for sludge application. Finally, crops and soils from sludge-treated sites should be periodically analyzed for trace elements, including cadmium, chromium, copper, lead, nickel, and zinc.

Sludge analyses for cadmium, chromium, copper, lead, nickel, and zinc should be carried out quarterly on a composite sample obtained from all drying beds. At least one sample per year should be analyzed for arsenic, cobalt, manganese, mercury, molybdenum, selenium, and vanadium. These results should be periodically evaluated for their significance to agricultural reuse, and pronounced variations in the level of any element should be noted.

An information pamphlet on Modesto sludge should be prepared for distribution to sludge users. This pamphlet should include the results of the four most recent quarterly analyses. Guidelines for application rates and site selection and management should also be discussed. The potential hazards to soils and crops which could result from improper site management should be clarified. In general, application rates should not exceed two dry tons per acre per year, although specific site conditions may necessitate lower rates. For this application rate to be used, soils should have a cation exchange capacity of 15 or more and a pH of 6.5 or more. Sites should be sufficiently level to prevent surface runoff, preferably with slopes of less than 5 percent. A list of names and addresses of farmers using sludge should be maintained by the city or sludge supply company for use in the event that further communication is required.

A program should be developed for identifying the major discharge sources of lead, chromium, and other toxic metals which may appear in excess in the sludge. Major dischargers should be required to reduce the level of these elements in their discharges to municipal sewer lines.

Alternative sludge management procedures should be developed by the city in order to prepare for the possibility that agricultural reuse becomes infeasible or that the agricultural market cannot absorb the total volume of sludge production.

Chapter 13

CONSTRUCTION-RELATED IMPACTS OF THE PROJECT

The proposed project involves modification or construction of facilities at several different locations in the Modesto area. The significance of construction-related impacts usually depends on site-specific conditions. Thus, the following discussions are organized in terms of project elements at different locations. Construction activities associated with various components of the project are expected to continue for a period of about 18 to 20 months.

Noise

Primary Plant Site

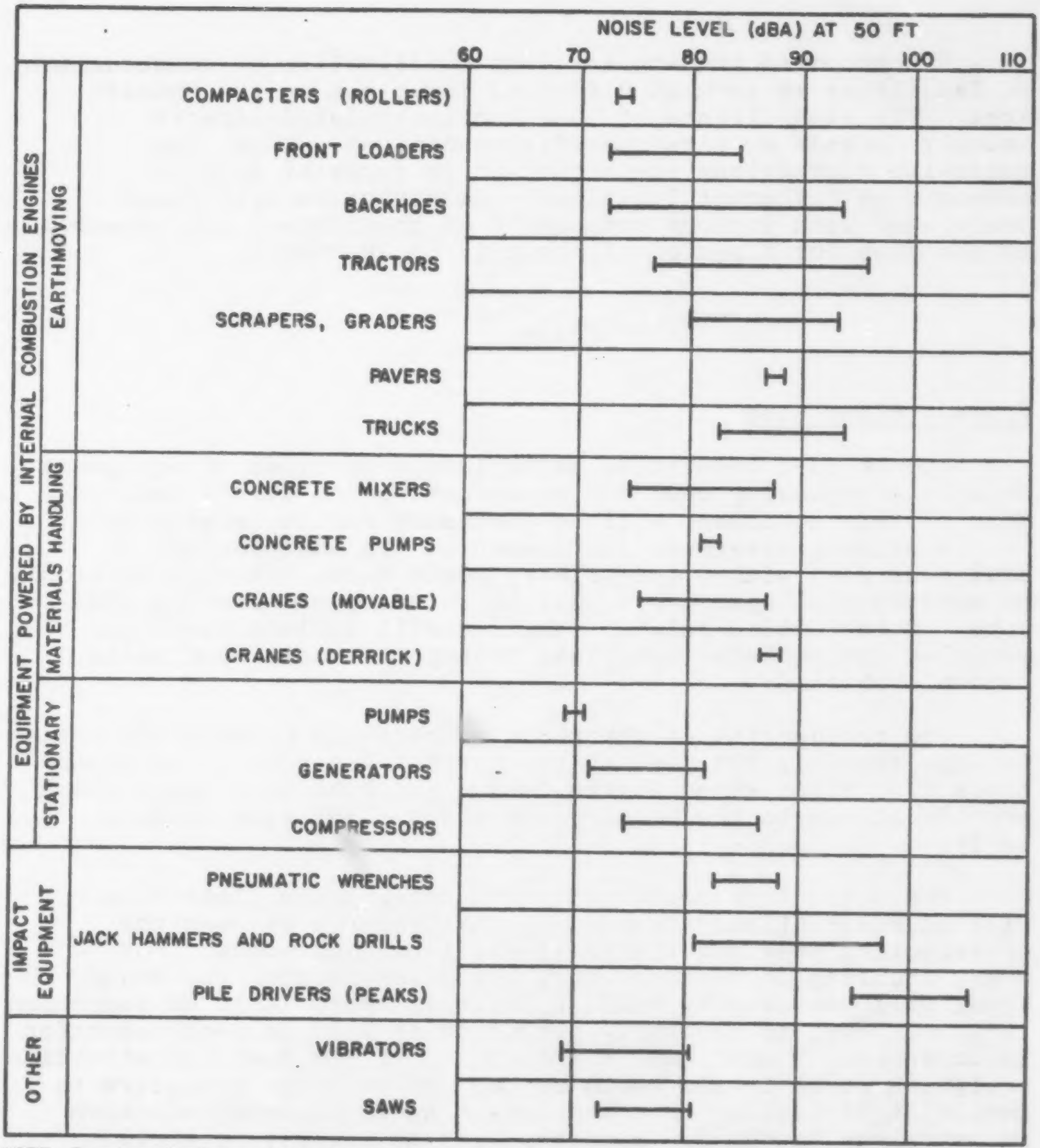
Figure 13-1 identifies noise levels by types of equipment which are typically used for construction and demolition. Most of this equipment will be necessary for implementation of the primary treatment improvements. In addition to equipment used within the primary plant site, vehicles related to construction operations will be entering and leaving the site. Construction-related vehicles will include passenger vehicles for workers, materials transport trucks, and waste removal vehicles.

The residential neighborhood nearest the primary plant site is approximately 800 feet to the north. Residential neighborhoods also exist along Sutter Avenue and Robertson Road, which provide access to the primary treatment plant site (Figure 13-2).

The noise from construction on the primary plant site will be substantially reduced by the distance between the construction area and the residential neighborhoods. For every doubling of distance from the noise source, the sound level will decrease by about 6 decibels (dB). A 10 dB reduction in sound level is generally perceived as a 50 percent reduction in loudness. Therefore, at a distance of 800 feet, construction equipment sound levels would be reduced by 24 dB (relative to levels at 50 feet). This represents an 81 percent reduction in perceived loudness. Barriers such as levees, vegetation and other buildings will further reduce noise levels experienced in the residential neighborhood. Resultant noise levels should be essentially the same as current daytime levels in the affected neighborhoods.

Figure 13-1

NOISE FROM CONSTRUCTION EQUIPMENT

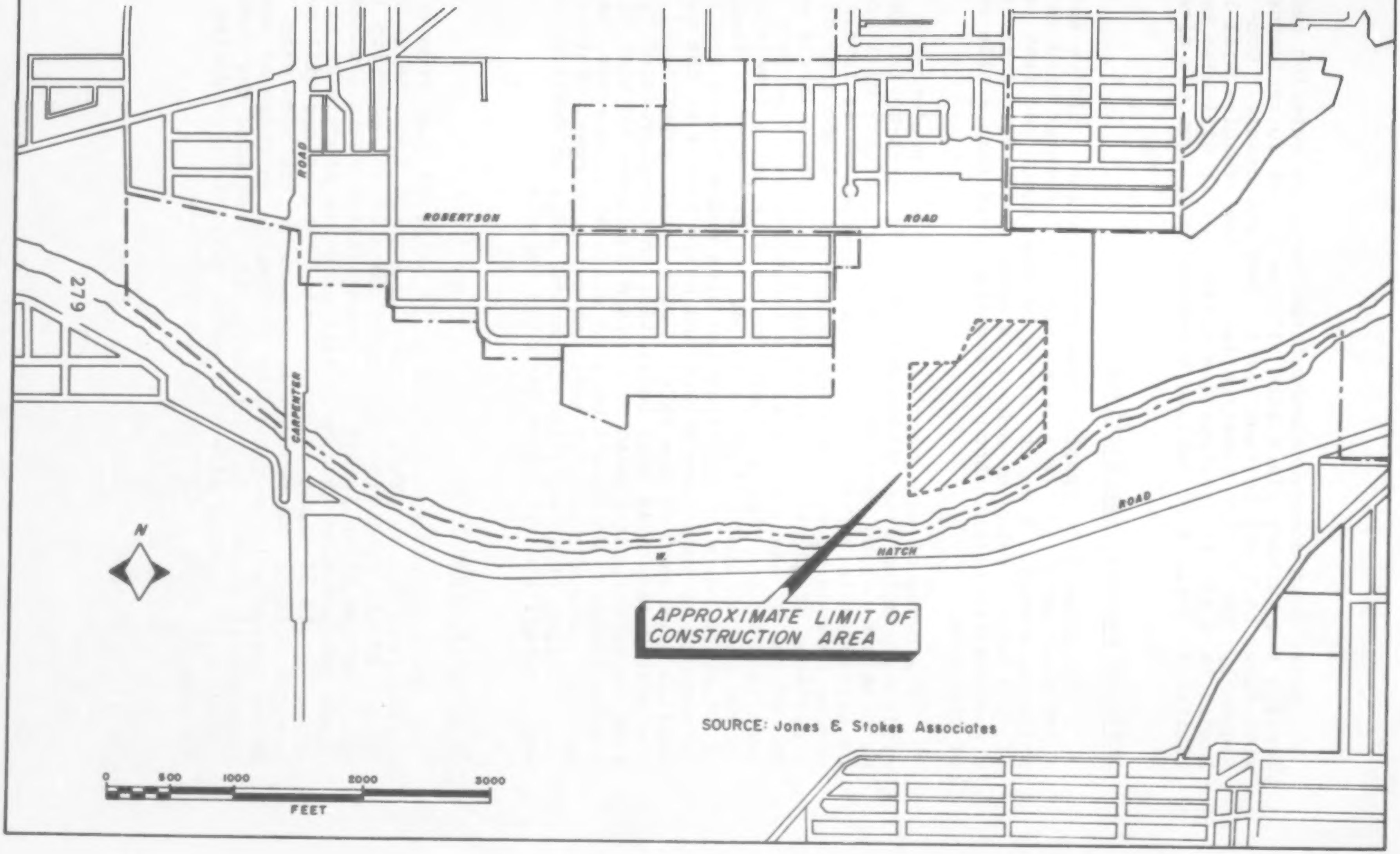


NOTE: Based on limited available data samples

SOURCE: U. S. Environmental Protection Agency, 1971

FIGURE 13-2

PRIMARY PLANT
SITE NEIGHBORHOOD


ROBERTSON
ROAD
ROAD
CARPENTER
279
W.
HATCH
ROAD
APPROXIMATE LIMIT OF CONSTRUCTION AREA
N
0
500
1000
2000
3000
FEET

SOURCE: Jones & Stokes Associates

Noise from construction-related vehicles entering and leaving the primary plant site will be closer to residences, with fewer barriers between the roadway and houses. Consequently, noise from construction-related vehicles will be louder than actual construction noise, but it will also be limited to periods of vehicle movement to or from the site.

Effluent Booster Pump Stations

The proposed Carpenter Road pump station would be about 1,700 feet north of the intersection of Carpenter Road and Whitmore Avenue. A farmhouse is located about 200 feet west of this site. Fairview School is about 2,400 feet east, and a residential neighborhood is somewhat less than a mile east of the site.

The types of equipment required for the preferred effluent pumping alternative will include earth-moving and materials-handling equipment. The major activity will probably be attributable to concrete mixers. Average noise levels during periods of equipment operation will be about 85 dB (at a distance of 50 feet). Construction site noise levels would be reduced by about 12 dB at the farmhouse (a 57 percent reduction in loudness). Construction site noise levels would be reduced by about 34 dB (a 90 percent reduction in loudness) at Fairview School. Construction site noise levels should be reduced to less than background noise levels at the residential area east of the site. Noise levels experienced at the nearby farmhouse will be similar to those produced by traffic on Carpenter Road or by farm equipment working in nearby fields. Construction site noise will, however, be more continuous than such existing noise sources. Future construction of an additional pumping plant at Jennings Road would entail similar types of noise impacts.

Effluent Storage Pond

The proposed storage pond will be 2,400 feet from the closest residence. This distance (measured from the nearest border of the pond site) will provide a 34 dB reduction in construction noise levels (90 percent decrease in loudness). Since construction equipment will probably produce on site noise levels of about 90 dBA, construction noises will be noticed outside the residences closest to the pond site. Noise levels will be generally comparable to those of suburban residential areas. As pond excavation proceeds, the pond levees will provide effective noise shielding, producing a further 10-15 dB reduction in noise levels.

Noise impacts from transportation of excess spoil will probably cause more disturbance than on-site construction operations. The preferred storage pond alternative will require removal of an estimated 450,000 cubic yards of material. This would require at least 22,500 truck trips to and from the disposal area (at 20 cubic yards per truck). More truck trips would be required if smaller "standard" dump trucks are used (up to 90,000 trips at 5 cubic yards per truck). Areas along routes to the disposal sites would be impacted by this truck traffic. Roadside noise levels of 85-90 dBA would be produced by each passing truck.

Mitigation

Noise can be minimized by requiring that all internal combustion engines be equipped with mufflers and baffles and be properly maintained. Construction operations should be limited to normal daylight working hours. Vehicles should carry full loads of materials and passengers to minimize trips.

Disposal of Construction Debris

The primary treatment plant improvements will result in various types and volumes of waste materials. Among these are demolition debris from abandoned structures, materials packaging, residual construction material, displaced soil, and maintenance wastes (broken parts, lubricants, etc.). Most of these materials are basically inert (concrete, displaced soil, etc.). Such inert material might find a use as fill material at private fill sites or local construction projects. Otherwise, this material and all other waste materials would require disposal at an approved sanitary landfill site. The abandoned mixing basin on the primary treatment plant site might be used as a disposal area for inert materials (Hosegood, pers. comm.). This would, however, prevent use of that site for future facility expansions (due to foundation engineering considerations). The volume of construction and demolition wastes requiring disposal has not been estimated.

Spoil from excavation of the effluent storage pond will consist primarily of clean fill dirt with lesser amounts of roots, vegetation, rocks, etc. It is proposed that this material will be hauled to agricultural areas and spread over the land there. Pond excavation will produce enough spoil to cover a 279-acre area to a depth of 1 foot. The impacts of spoil disposal will include those from transportation and erosion. The acceptance of fill material by local farmers has not yet been determined, although no problems are anticipated at this time.

Erosion and Dust

At the primary plant site grading and excavation of facility sites, demolition of abandoned facilities, vehicle movements on unpaved roads and parking areas, and handling of debris from construction or demolition will produce dust and expose soil surfaces to erosion. The topography of the site will keep runoff waters on-site. Dust generated by construction activities will undoubtedly be carried off-site on occasion. During summer periods when dust is most likely to be a problem, the strongest and most frequent winds are from the northwest and northeast directions. Thus, dust from construction operations is unlikely to be a serious nuisance to neighboring residential areas.

Storage pond excavation and spoil hauling will generate localized dust problems. Any erosion at the storage pond site will generally be contained within the excavation area. Both dust and erosion problems are possible at spoil disposal areas.

Mitigation

Normal dust control measures should be followed during construction (water sprinkling or chemical treatments such as calcium chloride or light petroleum products for construction and parking areas). Disposal areas on agricultural land should be replanted soon after disposal of soil. Exposed areas and spoil piles should be watered down to prevent dust. Exposed areas which will be incidental to construction and not required for operations should be reseeded following construction, preferably with natural vegetation.

Traffic Disruption

Construction activities at the primary treatment plant will not directly block or otherwise disrupt traffic patterns on adjacent streets. Movement of construction equipment, construction materials, new facility equipment, and construction wastes could result in temporary reductions in traffic flow on area roadways. This would be most likely for trucks bringing over-sized loads to the plant site (heavy construction equipment and new facility equipment).

It is unlikely that construction employees would park on adjacent streets due to the distance from the construction area. It is unlikely that such parking would have much impact on traffic flow in any event, since Robertson Road and Sutter Avenue do not carry high traffic volumes.

Construction of the new booster pumping plant at Carpenter Road would create a very minor traffic disruption. Possible disruptions that could occur from the Carpenter Road booster plant would be attributable to cumbersome movement of material and equipment trucks, cement mixer trucks, etc.

Excavation and placement of effluent distribution pipelines will temporarily disrupt traffic and agricultural land uses. Trenching adjacent to or within agricultural areas will temporarily restrict access and movement of agricultural equipment. Pipeline routes will intersect roads, requiring an open cut across pavement. Motor vehicle flow will be temporarily detoured or restricted for jackhammer and trenching operations across roadways.

Alternatives E, F, and G would all require a pipeline crossing State Highway 132 (Maze Boulevard). All alternatives would run across or adjacent to Grayson Road.

Mitigation

Trucks with over-sized loads should be routed to the construction site so as to avoid peak traffic periods and major local arterials. On-site parking areas should be provided for construction employees.

Disruption of Effluent Flow

Disposal of effluent during phases of new construction of pipelines and other facilities could be impaired.

Adverse impacts may be avoided by retaining existing pipelines, pumping stations, etc., until new facilities are put into operation.

New pump stations, for example, may be built separately and tied into existing pipelines during periods of low flow in the system. Temporary storage within the pipelines and emergency holding ponds may be used as needed while the new facilities are connected to the existing pipelines.

Disturbance of Cultural Resources

Excavation of the effluent storage pond and excavation for the effluent distribution pipeline have the potential for disturbing previously unknown historical or archeological sites.

Mitigation

Once the city selects a specific storage pond alternative and a specific effluent reuse alternative, reconnaissance level archeological field surveys of the affected areas should be undertaken. If significant cultural resources are discovered, further mitigation measures should be developed through consultation with the State Historic Preservation Officer. Actual construction operations should be monitored as suggested by Dr. Napton of Stanislaus State College (see Chapter 17, response to comments by the Advisory Council on Historic Preservation).

Chapter 14

SITE-RELATED IMPACTS OF PROJECT OPERATION

Noise

Noise generating equipment is or will be located at the primary treatment plant site, the effluent booster pump site, the oxidation ponds, and any pump stations required for effluent distribution. The various pumps and aerators at these facilities are electrically powered, and thus are not significant noise sources. The centrifuge for sludge dewatering at the primary plant site is used infrequently and its noise output is presently unknown.

Distances between treatment facilities and residential areas are such that the sounds originating on the primary plant site will be reduced by 24 decibels (81 percent reduction in loudness). Noise levels on the primary plant site would generally have to exceed 75 decibels before they would be noticed outdoors in neighboring residential areas. Similarly, the estimated 200-foot distance between the proposed Carpenter Road pump station and the nearest residence will provide a 12 decibel reduction from on-site noise levels. This represents a 57 percent reduction in loudness. Operating noise levels for the pumping facilities would generally have to exceed 60 decibels to be noticeable outside the nearest residence. Electrical pumps should not exceed this noise level. The estimated 2,200 feet between the oxidation pond aerators and the nearest residence will provide a 33-decibel reduction from on-site noise levels (a 90 percent reduction in loudness). Noise from the aerator location would generally have to exceed 80 decibels to be noticeable outside the nearest residence. Noise levels from the electrically-powered aerators are substantially lower than this.

Odors

Both the primary treatment plant and the oxidation ponds have experienced occasional odor problems in the past. Sources of odors at the primary plant site have not been investigated in detail, but undoubtedly arise from both the wastewater treatment and sludge processing portions of the plant. High solids loads associated with high flow periods can easily lead to anaerobic conditions and subsequent odor problems. Previous attempts to reduce odors by aeration treatment merely aggravated the problem by volatilizing anaerobic decomposition products (Amstutz, pers. comm.).

The current overloaded condition of sludge processing facilities provides conditions which could lead to odor problems from the sludge thickener, sludge digesters, or the sludge drying beds. The sludge processing improvements proposed as part of the project should reduce the occurrence of odor problems from the sludge processing portions of the plant. Odor problems at the primary plant site could develop on occasion even after the proposed plant improvements are completed. The frequency of such problems is difficult to estimate.

Oxidation pond odors produced by anaerobic conditions in the ponds should be reduced by the proposed addition of perhaps 36 more aerators to augment the 76 already installed. Mild odors are a possibility during the summer when withdrawal of effluent for irrigation exposes decomposing algae and other materials on the sides of the pond levees.

Leachate from Sludge Beds

Modesto's primary sewage treatment facility produces approximately 2,000 cubic yards of dried sludge annually. The final stage of sludge treatment, occurring after anaerobic digestion and coagulation, is the dewatering process. The slurry is spread to a depth of several inches on flat beds excavated from the natural alluvial deposits adjacent to the facilities. Drying occurs over a period of several months, during which time evaporation and percolation processes remove a large fraction of the excess moisture from the sludge solids. At many municipal facilities, sludge drying beds are underlain by tile drainage systems which allow for controlled removal of sludge leachates. However, the Modesto facilities do not have a controlled drainage system and are underlain by moderately permeable natural deposits.

The extent and potential hazards of sludge leachate in alluvial groundwaters was considered in an investigation of site hydrogeology, which included collection of both borehole and chemical data (H. Esmaili and Associates, 1978). One borehole was located in the overflow beds just to the west of the sludge drying areas, midway between the northern and southern boundaries of the sewage treatment plant. This location is believed to reflect the maximal effect of sludge leachate. Groundwater was encountered at a depth of 13.5 feet on September 14, 1978 (elevation of 39.5 feet). A sample of this water was submitted for partial chemical analysis. The results included a measured specific conductivity of 4,900 μmhos/cm, 247 mg/l SO_4 and 213 mg/l Cl. By way of comparison, typical summer values of these constituents in the river at the Tuolumne City gauge have been 600-800 μmhos/cm, and 8-15 mg/l SO_4 and 100-150 mg/l Cl; the conductivity and chloride content have probably dropped as a result of gas well plugging conducted by the Water Quality Control Board in late-summer 1977, although no recent analyses are yet available.

Although the alluvial groundwater is apparently contaminated, significant impacts on the river or adjacent land uses are likely to be very limited. The maximum conceivable volume of sludge leachate is approximately 20 acre-feet per year (0.027 cfs average). If the entire volume of leachate entered the river, it would amount to about 2×10^{-5} of the annual runoff at Modesto. No measurable change in the concentrations of any constituents in the river would be expected.

In the recent years, a cone of depression has developed in the downtown area. Gradients in at least some of the developed groundwater units are now northward, away from the river. Possible contamination of domestic and industrial supply wells by deep percolation is a distinct possibility if there are no restrictive clays to limit the downward or northward movement of the leachate-bearing alluvial groundwaters. City Well #15, situated near the entrance to the Sewage Treatment Plant, has evidenced a steady increase in sulfate content from 2 mg/l in 1958 to 20 mg/l in 1977. The quality of water pumped from this well remains excellent, and the current sulfate content is now comparable with that in other city wells in the area. Similarly, the sulfate increase could easily be due to other causes. However, some additional attention to water quality trends in this well may be advised.

Another potential impact of the sludge drying beds would arise from the subsurface movement of leachates into the Tuolumne River. However, no data are available to determine the actual impact of the sludge drying beds on the Tuolumne River.

Groundwater Impacts of Oxidation and Storage Ponds

The oxidation ponds have unlined floors and sides. During their construction, excavation exposed the underlying sediments, which were noted to be primarily fine-grained deposits with sand lenses. The terraces to the north and east of the ponds are also predominantly fine-grained, but include horizons of potentially permeable coarser sediments. Percolation may occur through either the floor or the sides of the ponds.

It is clear from water quality data that northward groundwater flow was occurring before the ponds were first used in March 1970. It is also evident that the locally high shallow water table existed in the area, and elsewhere in the TID service area, in the late 1950s. Yet these shallow water levels near the ponds have been particularly persistent during the

1971-72 and 1975-77 dry periods. While most near-surface water levels in the terraces were depressed 7 to 10 feet below their usual elevations during the summer of 1977, monitoring wells in the vicinity of the ponds remained relatively unchanged, in some cases declining less than one foot during the course of one of the driest years of record. It appears that percolation from the ponds may have been contributing to naturally persistent high perched water tables in the area.

Recent data indicate percolation rates of about 1.5 MGD. Initially, information obtained from operators at the pond site indicated a higher figure approaching the annual evaporative losses (3.0-3.4 MGD).

Construction of an additional 100-200 acres of storage ponds will result in additional percolation of effluent to local groundwater bodies, especially during the first few years of operation. Alternative C (the deep storage pond) and Alternative A (200 acres of storage ponds) would produce more percolation than the other storage alternatives.

Mitigation. Monitoring wells already installed can be utilized to investigate water level and quality changes surrounding the ponds. The city had managed to maintain a remarkably complete record of changes since the ponds were established. If necessary, drainage facilities should be installed to reverse any increase in local shallow groundwater tables.

Neighborhood Compatibility

The primary treatment plant site has been in use for sewage treatment disposal purposes since 1910. Over time, the most significant impact of this use of the primary treatment plant site has been unpleasant odors, particularly during the "problem period" of seasonally (July-October) high industrial waste loads. The odor problem, which was not significantly reduced until the construction of the remote oxidation ponds in 1967-68, has probably been a factor in the area's character of development.

In general, surrounding lands have remained unincorporated. North of the Tuolumne River, these lands constitute the community of West Modesto; south of the river, the community of South Modesto. Residences in both these areas are generally frame structures of modest value. Housing units in both South and West Modesto tend to be older, smaller and of lower value/rent than units in the City of Modesto. They also are more likely to be occupied by a household headed by a Spanish-speaking person or a person with a Spanish surname.

Generally, development pressures on unincorporated lands in the treatment plant site area can be characterized as negligible or slight. The extent to which the plant operations themselves have contributed to this condition in the past is not known. However, West Modesto and South Modesto are considered to be amoung the least desirable areas for new development in the Modesto urban area. Even if all adverse effects of the current treatment plant location were eliminated, the existing development characteristically discourages new private development; subsidized units have, however, been constructed under rental assistance programs in 1951 and 1970.

Given adverse conditions for private development of any scale in the area, the treatment plant improvements currently proposed appear unlikely to alter existing land use and development conditions in the area. Eventually, odor minimization and reliable operation of the plant may be important considerations in the development of currently undeveloped lands lying south of the Tuolumne River, opposite the treatment plant. This area is designated in the 1975 Stanislaus County General Plan as "urban transition".

The project appears unlikely to have any adverse land use impact on Dryden Park Municipal Golf Course, which lies immediately to the east.

In 1966-67, the City of Modesto constructed a complex of oxidation ponds on 843 acres adjacent to the San Joaquin River west of Jennings Road between county roads J-16 and J-17. The complex consists of five ponds of from 102 to 178 acres each, with auxiliary pumping and maintenance facilities and an outfall to the San Joaquin River. In effect, the complex is an open space of ponds frequented by waterfowl.

The proposed project would involve the expansion of activities in this general area of the county, with the construction of additional treated effluent storage facilities and the application of reclaimed wastewater in the irrigation of adjacent pasture lands. The land use impacts of these activities appear to be minimal. The principal adjacent land use is pasture land; the high water table inhibits the use of the land for other agricultural purposes.

The land use element of the Stanislaus County General Plan indicates that agriculture is the planned land use in this area. Continued operation of the oxidation ponds and use of treated effluent for pasture irrigation would not violate the county general plan. The fact that at least part of the oxidation pond site (the portion closest to the river) lies within an inundation hazard area (flooded in 1955) and within the conservation area designated in the general plan suggest that a continued open space use of the site is appropriate.

Installation of the booster pump stations on the pipeline between the primary treatment plant and the oxidation ponds should have no significant land use implications for adjacent properties. Effluent distribution pipelines and related facilities will require restrictive easements. Uses of the pipeline right-of-way would be limited to roadways, power lines, other utility facilities, and most agricultural uses.

An effort has been made in all proposed alternative alignments to route pipelines within existing easements, rights-of-way, and utility corridors to minimize alteration of existing land uses and restrictions on future uses. Where private rights-of-way are required, condemnation proceedings will be required; but pipeline construction should not impair long-term agricultural uses of the property. While no buildings could be constructed in the pipeline right-of-way, few uses of the adjacent lands would be prevented by the existence of the pipeline.

Facility Disruptions from Hazards, Accidents and Operational Problems

Damage to treatment facilities from environmental hazards or accidents could alter treatment capabilities or effectiveness, causing violations of discharge requirements or reclamation permit conditions. Nuisance conditions or health hazards could also be created at facility sites.

Seismic hazards are relatively low in the Modesto area, although known faults occur in both the Sierra and Coast Ranges. Floods represent the hazard condition most likely to affect facility operations. The primary plant site is protected by levees which have crest elevations exceeding 59 feet above sea level at the upstream end of the plant site, and 57.5 feet at the downstream end. The sludge drying beds and emergency storage ponds at the site have been flooded on several occasions. During 1969, Tuolumne River flows of 32,700 cfs (cubic feet per second) flooded much of the plant site, reaching to the southerly clarifier and chlorine control building (Amstutz, pers. comm.). Since then, expected flood frequencies have been significantly reduced by the construction of New Don Pedro dam. Estimated 100-year flood discharges at the Ninth Street bridge gauging station are 41,000 cfs (U. S. Geological Survey, 1977), indicating that the plant site would again be flooded during such flood events. Estimated 50-year flood discharges are 11,300 cfs (U. S. Geological Survey, 1977).

As the Tuolumne River is strongly constricted at the sewage treatment plant, a minimum freeboard of 3-4 feet should be required along the unengineered levees. River stages exceeding 55.0 to 55.5 feet are likely to cause flooding within the levees and the potential introduction of sludge into the Tuolumne River channel. This stage is equivalent to a discharge of about 22,000 cfs.

The estimated recurrence interval for a stage of 55.0 to 55.5 feet is approximately 70 years. This estimate is based on an interpretation of computations in U. S. Army Corps of Engineers (1972). It appears that peak discharges have been augmented by land use changes and drainage improvements since the analysis was made, and that these increases will continue to take place. Similarly, channel capacity of the Tuolumne River appears to have been reduced by the growth of vegetation since the 1969 flood and by construction of levees, bridges, and bank erosion protection measures during the past decade. It is also possible that the Tuolumne River channel has aggraded below the confluence of Dry Creek; no new surveys have been performed to provide field data on the affected river channel. Therefore, it is likely that river stages exceeding 55.0 feet will recur somewhat more frequently than on an average of once in 70 years.

As is true in any wastewater treatment operation, the potential for accidents exists. The most common type of accident is injury to an individual operator, generally a machine-related accident. Normally, an accident such as this would not interfere with treatment. The most potentially dangerous accident would be a chlorine leak at either the primary plant or the remote oxidation ponds. Although such accidents rarely occur, especially at such well-maintained plants as the City of Modesto's, they are possible. Naturally, the severity of the accident would be a function of the amount of chlorine released. No increase in chlorine storage is planned at the primary plant, while increased storage is planned at the remote ponds.

The principal operational problems that may be encountered are loss of pumping capacity, loss of power, and odor production. At each pumping station, a standby pump having a capacity equivalent to the largest pump is provided. However, if two pumps were to fail simultaneously, the pumping station would overflow. Situations of multiple pump failure are, however, extremely rare. Loss of power would not be significant at the primary plant, as the plant would probably be capable of operation using only the on-site electrical generators. Loss of power for the remote oxidation pond aerators could result in odor production if the power outage should be prolonged.

Resource Impacts of Facility Operation

Electrical energy is required at the primary treatment plant, the booster pumping station, the remote oxidation ponds, and for effluent storage and distribution. Energy generation will also be accomplished at the primary plant using gas from the anaerobic digesters. The electrical energy generated will exceed the power requirements of the primary plant. At present, no plans have been made for utilization of this excess energy, although it is conceivable that it could be either sold to a power company or transported to the remote oxidation ponds for use in running the aerators. Energy requirements for treatment of 1989 flows, assuming all generated energy is used for treatment, are shown in Table 14-1.

Electrical energy, chlorine, and sulfur dioxide will be required for the storage pond and distribution system alternatives. Chlorine and sulfur dioxide are used for disinfection prior to discharge of effluent to the San Joaquin River. These requirements are shown in Table 14-2. No substantial chemical requirements are necessary at the primary plant.

Table 14-1

Energy Requirements for Treatment
Year 1989

Primary Treatment	1,929,530	kw-hr/yr
Booster Pumping Station	436,590	kw-hr/yr
Oxidation Pond Aerators	3,551,730	kw-hr/yr
	5,917,850	kw-hr/yr
Digester Gas Credit	3,843,370	kw-hr/yr
Net Energy Requirement	2,074,480	kw-hr/yr

Source: Jenks and Harrison, 1976.

Table 14-2

Energy and Chemical Requirements for Effluent Storage and Distribution Year 1989

Storage Pond Alternatives	Electrical Energy kw-hr/yr	Chlorine tons/year	Sulfur Dioxide tons/year
A	30,400	32	10
B	33,800	32	10
C	30,400	32	10
D	16,600	44	13
Effluent Distribution Alternatives			
A	868,000	254	--
B	801,500	254	--
C	792,000	246	--
D	766,200	236	--
E	717,500	54	--
F	676,300	146	--
G	631,300	130	--
H	705,700	254	--

Source: Jenks and Harrison, 1978a.

Chapter 15

EMPLOYMENT AND FISCAL IMPACTS OF THE PROJECT

Construction Period Employment Impacts

All project alternatives have in common the fact that they would require major new construction, thereby generating a need for construction workers and providing income to these workers for the duration of the construction period. Assuming approximately one person-year of construction employment per $60,000 of construction costs yields estimates ranging from 139 to 418 person-years of construction employment resulting from the alternatives shown previously on Table 3-1. These construction cost estimates are lower than the probable final project construction costs since they assumed completion in 1978; however, the person-years of employment should not vary significantly from this estimate.

Economic and Employment Impacts of Facility Operation

Any of the alternatives would result in the employment of approximately three additional operators at the primary treatment plant. Permanent employment associated with the secondary treatment process for the river discharge alternatives ranges from 6 to 15. For the land use application alternatives permanent employment associated with secondary treatment and distribution of the effluent ranges from 2 to 6. Total permanent employment associated with the project alternatives thus ranges from 5 to 18.

In addition to direct employment effects, the proposed provision of effluent to individual growers and/or the West Stanislaus Irrigation District (WSID) could have direct economic impacts. Provision of the effluent would not likely alter the nature of local agriculture as it would not substantially increase the potential supply of irrigation water in the area. Its effect would be to supplant other sources of irrigation water. If the supply conditions were more restricted, the provision of the effluent could have a much greater impact as it could affect the type of crops grown.

The economic impacts of the provision of effluent to private users free of charge would vary according to the distribution alternative chosen and the sources of water ultimately supplanted.

Current sources of irrigation water include rivers, groundwater, irrigation districts and drainage canals. The effluent would be of lower quality than some of the irrigation water available from the current sources, although it would provide a more dependable source than some current sources. Growers may also have to provide tailwater recycling systems on their sites in order to use the effluent depending on where the effluent is delivered to them by the effluent pipeline distrubution system. Where the effluent would supplant water supplied by an irrigation district to a grower (or by the Delta-Mendota Canal to the WSID) a direct economic benefit in the amount of the user fees avoided less the additional costs of using the effluent would be realized by the recipient. Where other sources would be supplanted, an economic benefit would result only to the extent that costs of using water from these other sources, such as pumping costs, which would be avoided are greater than the costs of using the effluent.

Project Financing and Fiscal Impact in the Service Area

Table 3-1 showed the estimated construction costs, annual operation and maintenance costs and resulting present worth of the project alternatives. The cost estimates shown on that table clearly indicate that the river discharge alternatives are more costly than the land application alternatives, although the construction cost estimates shown are predicated on a 1978 completion date. Estimates reflecting a later completion date have not yet been prepared, but would not be expected to affect the relative distribution of the alternatives.

Wastewater treatment costs are currently allocated to users through sewer service charges and ad valorem taxes. Current sewer service charges average $25 per residential user annually and $156 per million gallons of industrial discharge. A surcharge on industrial discharge of BOD at $13.80 and suspended solids at $13.80 per 1,000 pounds over 200 mg/l is also assessed. All capital (construction) costs of new facilities would be allocated to users through sewer service charges, but operating costs could be charged through ad valorem taxes if Modesto meets federal requirements. The potential impacts of each of the alternatives on per unit service costs are not known at this time.

Chapter 16

CONSEQUENCES OF A SIGNIFICANT REDUCTION IN INDUSTRIAL WASTEWATER DISCHARGES TO THE MODESTO WASTEWATER TREATMENT SYSTEM

The facilities in the Modesto sewage collection and treatment system involve a substantial capacity used to process industrial waste discharges. Seasonal industries, in particular, contribute to this capacity requirement. While about 27 percent of the annual flow processed by the city comes from seasonal industries, 61.6 percent of the peak month flows are generated by these industries. These industries are not obligated to discharge their wastewater to the city system, although they have found it advantageous from economic and practical standpoints to do so. The viability of the city's proposed irrigation reuse project requires a contract between the city and various agricultural interests. Thus, the implications of reduced industrial discharges to the system are issues worth evaluating.

Potential for Reductions in Industrial Discharges

Significant reductions in cannery discharges to the Modesto sewer system would occur if major canneries moved out of the area, developed their own wastewater treatment and disposal facilities, or adopted major water recycling programs. It seems unlikely that any of the major canneries will close or move out of the Modesto area in the near future. It also seems unlikely that major recycling programs would be implemented in the absence of a serious and sustained water shortage. It is possible, however, that some canneries might develop their own treatment and disposal facilities if service costs associated with the Modesto system became great enough to justify the costs of developing a separate system.

Three local canneries (Tri/Valley, Tillie-Lewis and Del Monte) have in fact investigated the possibility of discharging raw process water directly into the canal system of the Modesto Irrigation District (Bottel, pers. comm.). A brief pilot program in 1977 did not indicate any serious technical problems as long as adequate dilution was maintained. A legal opinion from the chief counsel to the State Water Resources Control Board, however, indicated that wastewaters discharged to irrigation district canal systems would require secondary treatment comparable to that required for direct river discharge. As long as such conditions are applied to potential irrigation reuse of cannery effluent, it will probably be economically advantageous to remain in the Modesto system. At the present time, it does not seem likely that any of the major canneries will cease discharging to the city's sewer system. At sometime in the future it might become economically feasible for some canneries to develop and operate an irrigation system in which cannery wastes are delivered by pipeline and no irrigation runoff enters any stream or major irrigation canal. Such a system would not require secondary treatment of the wastewater as long as irrigation was restricted to fodder, fiber, orchard, vineyard, or seed crops.

Impacts of any Reduction in Industrial Discharges

While there does not appear to be much prospect for major reductions in industrial discharges in the near future, the readily apparent consequences of such reductions are addressed below.

Necessity for Project Design Changes

As presently planned, the city would discharge about 1.4 billion gallons of effluent to the San Joaquin River during the winter. Total effluent loads from seasonal industries amount to about 2.1 billion gallons per year, and are projected to reach 2.5 billion gallons per year by 1997. Thus, as much as 68 percent of the current seasonal industry flow (or 56 percent of the projected 1997 flow) could be removed from the city system without affecting the amount of effluent available to agricultural users. Reductions in industrial discharges would reduce the need for intermittent winter discharge to the river, but have little effect on the city's ability to supply contracted amounts of reclaimed wastewater.

Growth Implications

Reduced discharges by seasonal industries would increase the capacity of the city's interceptor and treatment facilities available to accommodate new urban development. But since wastewater handling capacity will be significantly increased by the proposed project even with no reduction in industrial flows, this factor does not seem too significant. The most significant aspect of reduced cannery flows would be the effective increase in sludge handling capacity by the present and proposed sludge facilities. The proposed sludge facilities will provide adequate capacity for about 10 years if all existing industries continue discharging to the system. Because cannery flows have such high solids loads, reduced cannery discharges would allow existing and proposed sludge facilities to serve substantial future residential and commercial development.

Fiscal Implications

The August 1976 project report contained a revenue program which estimated an annual cost of $29.82 for each residential user in 1978-79, following completion of the new facilities. Following completion, however, it is possible that one or more of the large industrial users may elect to withdraw from the city's system for monetary or other reasons. Although such a withdrawal would decrease the annual operation and maintenance expenses, the cost of bonds sold for facility construction would continue, placing an additional burden on the remaining users of the system.

To estimate the impact of one or more of the large industrial users withdrawing from the system, a hypothetical 50 percent decrease in industrial flow was assumed. Although charges to industry are based on both wastewater flow and quality, and quality varies widely from industry to industry, a 50 percent flow decrease was assumed to result in 50 percent fewer dollars collected by the city from industrial users. Using the revenue program in the 1976 project report as a basis, the annual cost for a residential user was estimated to increase from $29.82 to $36.81. This would represent an increase of slightly over 23 percent to residential users.

The costs which were included in the 1976 project report, and which were used as a basis for the above estimates, were based only on primary plant site improvements. When the effluent disposal/reuse aspects of the project are finalized, and a revenue program completed, a cost for residential users will have to be calculated. Although this cost is not known at the present time, a similar 23 percent increase to residential users could be expected by a 50 percent decrease in industrial flow.

Chapter 17

RESPONSE TO COMMENTS ON THE DRAFT EIS

Summary of the Public Review Process

The Draft EIS on the proposed improvements to the Modesto wastewater treatment system was released on April 27, 1979. Over 200 copies of Draft EIS documents (Summary Report, Draft EIS, Appendices) were distributed to agencies, organizations, and members of the public interested in the project. Copies of the EIS documents were also made available for public review at the Modesto-Stanislaus Library, the Modesto Department of Public Works, the Modesto League of Women Voters, and EPA offices in San Francisco and Washington, D. C.

A public notice announcing a June 27, 1979 public hearing on the Draft EIS was published in the Modesto Bee on May 9, 1979. A press release with the same information was also sent to recipients of the Draft EIS documents. An eight-page tabloid summarizing the Draft EIS and inviting comments and public hearing testimony was published in the June 24, 1979 (Sunday) edition of the Modesto Bee.

The public hearing on the Draft EIS was held on Wednesday, June 27, 1979 at Modesto City Hall. Two sessions were held, one beginning at 1:30 p.m. and the second at 7:30 p.m. The hearings were broadcast live on the local public television station. The afternoon hearing session was attended by about 40 people, while about 25 attended the evening session; 15 people made formal comments at these sessions. The formal comment period on the Draft EIS was kept open until July 27, 1979. A total of 30 persons or agencies have submitted comments on the Draft EIS, either verbally at the public hearing or as formal letters of comment.

Comments and Responses

The following section reproduces the letters of comment on the Draft EIS and summarizes the public hearing presentations. The complete hearing transcript is available through EPA, Region IX, San Francisco. Responses to questions or issues raised by these comments are presented immediately following the appropriate letter or hearing presentation summary. Some hearing presentations and letters are informational or position statements which do not require a response.

It should also be noted that the newspaper tabloid material mentioned above included a page for comments about issues addressed in the Draft EIS. Thirty-two of these questionnaires were returned to EPA (Table 17-1). They will be considered along with the public hearing transcript, letters of comment, and this Final EIS before EPA makes a decision on the city's grant request. Because they are more in the realm of position statements than comments on the Draft EIS, these questionnaire forms are not responded to in this Final EIS.

Comments From the General Public

Joe Byrne. Public hearing comment: Any project that recharges groundwater supplies with good quality water should be supported.

Albion Fenderson. Public hearing comments: If projected growth does not occur, then the capital investment in the project is wasted. Growth projections should be reevaluated because two factors are working against growth. The people of Modesto may decide such growth is not desirable. And the industrial expansion necessary as a base for growth is becoming increasingly difficult. Air quality restrictions are a major constraint on new industry.

Response. As discussed in more detail as a response to questions raised by Laurence Martin and others, 62 percent of the estimated construction cost for initial project construction is related primarily to solving existing facility problems rather than increasing plant capacity. The revised capacity analysis of the project (Chapters 3 and 4) also indicates that the capacity increase provided by initial project construction will be used rapidly even if growth rates drop significantly in the future. The Gruen Gruen + Associates growth forecasts (Chapter 5 and Appendices A and B) do in fact project a reduction from recent growth rates.

The concern over building unutilized capital facilities is one reason behind the 10- and 20-year time frames used in the Clean Water Grant program. While there does not seem to be much likelihood that initially constructed facilities will be unused, probable growth rates should be reexamined before planned future construction proceeds.

Gabe Gamboa. Public hearing comment: The Draft EIS does not address the water supply impacts of growth.

Response. A new section on water supply issues has been added to Chapter 7 in this Final EIS.

Oscar Hackett. Public hearing comments: Urbanization is eliminating groundwater recharge, and there is too much waste of water. Chemical fertilizers are also polluting the groundwater.

Table 17-1

SUMMARY OF RESPONSES TO QUESTIONNAIRE FROM NEWSPAPER TABLOID

1. What are your concerns regarding future growth in the Modesto area?

Growth should be stopped:	5
Because of increased taxes	2
Because of increased noise	2
Because of increased air pollution	3
Growth should be controlled:	
Because it will destroy farms and the quality of life and will result in urban sprawl	26
Growth is needed for a healthy economy	3

2. How significant is the issue of agricultural land urbanization?

The issue is very important because prime farmland is disappearing and food may become scarce.	30
The issue is not important because farmers are still paid not to produce crops.	3

3. How effectively are local, state and federal governments dealing with this issue?

Not very effective	16
Not very effective because developers have upper hand	9
Not very effective because the government supply housing for the poor	2
Don't know	3
Only local government is doing fine due to Measure A	2

4. What else should be done, and by what agencies?

SAAG should monitor the needs of the City and County	1
No more expansions of sewage treatment plant	3
An EIR should be prepared for all new housing developments	1
Growth should be directed towards non-prime lands	2
More high-rise buildings	4
Improve public transit	3
General Plan boundaries should be revised inwards	1
Federal Government should enact strict land use laws	2
State should set urbanization quotas for each county	1
Allow additional flows for canneries but not for homes	1
Government should not interfere in growth concerns	1
Local governments should have more power	2

5. What do you see as the most effective means of mitigating the loss of prime farmland?

There are no effective means of mitigating this loss	1
Develop city on non-farm land	5
Limit acreage available for development	1
Delineate greenbelts	1
Tax breaks for farmers	2
Controlled growth	8
High rises, re-development of inner city, increase density	6
Smaller lot sizes	2
Restrict government funding	2
More legislation to protect ag land	1
Prevent profits in land speculation	1
Do nothing	2

6. What comments do you have on the following issues, River Discharge vs. Agricultural Irrigation for Effluent Disposal.

Reuse effluent if safe	16
Monitor for possible health hazards	5
Prefer River Discharge	2

7. Public Health concerns with irrigation reuse of treated effluent:

Treated effluent should be monitored	15
Concerned about the reuse of treated effluent	4
Not concerned about the reuse of treated effluent	3

8. Air Quality Impacts of Urban Growth:

Concerned about Air Quality Impacts	13
" due to chimneys	2
" due to cars	5
" due to crop burning	2
" due to adverse effect on crops	3
No great concern	2

9. Measures to Reduce Air Quality Impacts of Urban Growth:

More mass transit	17
Restrict agricultural burning	3
Restrict more development	6
Enforce Auto Standards/Restrict Auto Use	4
Better timed traffic lights	2
Encourage high-rise growth	2
More trees	2

10. Other Issues or Topics:

Increase in crime	3
Increase in noise levels	2

Note: The newspaper tabloid used an "open ended" questionnaire format rather than a multiple choice format.

Response. A new section on water supply issues has been added to Chapter 7 in this Final EIS.

Arlo Hilkey. Public hearing comments: Effluent reuse should be supported. Urbanization of farmland is a problem. New growth should be directed onto poor quality lands.

Leo Moses. Public hearing comments: Since retiring to Modesto, there has been nothing but growth. Growth is causing traffic, air pollution, and noise problems in Modesto.

Rudy Potochnick. Public hearing comments: Modesto has done a good job of land use planning. But growth pressures, to a large degree, originate from outside the Modesto area. It is not easy to control growth at the local level. The city should, however, be cautious about trying to attract new industry, or even large residential development projects. The federal government can encourage growth to occur in regions of the country where that growth will cause the fewest problems.

(HE-153) 17

3043 North Ave.
Modesto, Calif.
95351

U.S.E.P.A.
REGION 9
COMM [illegible]

August 14, 1979

U.S. Environmental Protection Agency
Attention: Hearing Office, HE-153
Region IX
215 Fremont Street
San Francisco, Calif. 94105

Dear Sirs:

I would like to comment on Modesto's request for a grant of public money to build a larger waste water system. I am opposed to this grant for several reasons.

1. Modesto, at the present time, is consuming prime farm land at an alarming rate. I have a farm west of freeway 99 on North Avenue which is located approximately one-half mile north of M.J.C. West campus. City planners have given our farming area the name of College West Neighborhood. At the present time, a sewer line goes through one corner of the area. It was originally put in for engineering purposes and to serve the old Modesto State Hospital, which is now the West Campus of M.J.C. When this line was put in, we farmers were told that this line was put in to serve the hospital and not to break up the area for city and that we were not in the sewer area. Last October public hearings were held at which time the requests of "investors" and developers was granted by the city council pending more sewer grants. The lines are being enlarged by going farther west, and it seems indefinite exactly how far out in our prime orchard area they really plan to go. At the present time, the 99 highway and the Southern Pacific railroad on the east and the M.J.C. project on the south, make an excellent buffer between rural and urban areas. If this line is once broken, there is no telling how far to the west they will go. The city planners told the investors and developers at the hearings that all this hinges on receiving sewer grants from the government. I object to our public monies going to destroy Non-replaceable prime farm land.

2. This land is all served by the Modesto Irrigation Districtby gravity water and the lines are in and paid for.

3. Underground water tables are recharged by this good pure water. This area also has good percolation due to its excellent soil types.

4. Modesto is becoming too large and is becoming a menace to agricultural crops and people by increased air pollution. If this rapid growth is not curbed soon, what little prime farm land that is left will not produce to its potential due to air pollution.

The developers and their very able attorneys go to great lengths at city council hearings to convince the council that this land is not really important to agriculture due to the fact that orchards are being grown on foothill land east of Modesto on land land that is not prime farm land, so they conclude that prime land is not that important. They say that technology is the answer. I question the developers and attorneys expertise on farm production. All of this hill land prior to orchards was sucessfully farmed, either to grain or pasture crops. Deep wells were drilled, expensive power consuming sprinkling systems were installed, and water tables are now dropping all over the area including Modesto. Efficient family farmers are being forced off flat prime land due to these development pressures and are being replaced to a certain extent by large corporation enterprises with some of them in it for tax advantages only.

Technology does play a part in production of crops, but prime land to start with is just , if not more so, as important. Let't look at the city of Modesto.

Is Modesto soon to be joined to Empire, then to Waterford on the East, Salida and eventually Ripon on the North, Ceres and on to Keyes on the South and Riverbank on the Northeast and soon a great distance to the West? This is history repeatingitself of what happened in Los Angeles, San Jose and San Diego.

I was born and raised on a diversified farm in eastern Los Angeles County. We produced oranges, walnuts, tomatoes, beans and alfalfa. Our land was prime and the climate was very suitable to those crops. All was well until about the time of World War II, when the big land grab began. The best land was paved over--First city zoning laws were past, sewer districts formed wilth the land paying for them in taxes and assessments whether they were available to the farmer or not. Then the farmers who didn't sell out were taxed very heavily and they began to wonder if farming there was worth it. Soon enough of the area was urbanized that the big gray monster SMOG appeared in the sky. The L. A. basin just wasn't and still isn't able to handle all the pollution that development has generated. What agriculture is left just doesn't produce like it did when the air was clean--in fact orchard trees became un-economical and the worst areas died. As a young man I saw this take place and decided to move to the Modesto area 31 years ago. I located on a farm on North Ave, then three miles north of Modesto. I am still here and very disturbed at what is taking placein Modesto and Stanislaus County.Developers and investors posing as farmers are coming here from far and near telling us farmers that this is just progress. The developers and investors are very anxious for more sewer grants so that they can cash or trade out and up for more and more prime acres just a little farther out. The land grab is going strong here. They give lip service to try to mitigate this trend but all the time not really meaning it. They are heavy contributorsto city council and other governmental candidates who go along with their cause. They exert tremendous political and economic pressure any place and any time in order to get their ends accomplished . They have plenty of time and money and they say they are only building to supply the needs of the people. If they are only building for the needs of people, let's not give federal grants which will enable them to continue the destruction of this valuable, non-replaceable resource at even a more rapid pace.

Most of the land that the state of California rests upon is not prime so let's direct these public monies to areas only that are not prime farm land. There isn't any argument about what is prime land and what isn't in the Modesto area since it is all charted and evaluted very accurately.

Modesto is simply situated on some of the best farm land in the world, with an excellent climate for a wide range of crops. It also has good water that flows to the land without consuming our valuable energy, which is in short supply.

Thank you for letting me express my views.

Sincerely,

Norman E. Driver

Norman E. Driver

Response to Comments by Norman Driver. The sewer trunk project referenced in this letter is the West Trunk project. The relationship between the West Trunk and the proposed treatment plant improvements is discussed in Chapter 3 of the EIS (No Project and System Capacity Following Completion of the Proposed Project). Air pollution impacts on agricultural crops in the Modesto area were discussed in Chapter 6 of the Draft EIS; that discussion was moved to Appendix K during preparation of this Final EIS. Chapter 5 of the EIS discusses the status of prime farmland, including the issue of bringing new lands into production to offset lands lost to urbanization.

/ 29

U.S.E.P.A.
REGION 9
COMM CNTR
JUN 29 11 57 AM '79

June 25, 1979

U.S. Environmental Protection Agency
Region IX
ATTENTION: Hearing Office HE-153
215 Fremont St.
San Francisco, CA.94105

RE: Your Imminent hearing regarding the Environmental Impact of the Modesto Wastewater Facilities Improvement Project.

From A Concerned Citizen

I would like to comment on the proposed improvements to our waste water system and make some suggestions as to the applicable solution to the problems encountered in this project.

The proposed improvement to our current facility is a very good idea from the standpoint of future development in this area. It will enable us to meet the federal and state limitations on discharge into the San Joaquin River system, it will allow development of housing and industry in this area, and last but not least the method of financing it eases the direct cost the county must pay.

But I believe it is a costly and ineffectual method of protecting the future environment here in Stanislaus County. (By future, I mean 10 years from now) This improvement will pave the way for extending our sewage system in this incorporated area. We have voted on a closely related issue in Modesto not to long ago regarding just the city. This issue will affect this city very highly, inasmuch as we are the largest metropolitan area in the county. If we improve the system of sewage treatment here it will be an excuse for the developers, (both tract and industrial), to rationalize their projects in expansion of metropolitan area. "We have sewage facilities for 84,700 additional residents, lets provide the housing", is a phrase I can see being used in advertising for the next vote on extending the city sewer trunk system in 1981 or 1982.

As one who is concerned regarding the quality of living here, not necessarily the quantity I think it would be highly commendable if we did not fund this improvement yet or approve of the funding yet. This can be costly to defer the construction as all delays can, but I believe there are yet a few avenues to explore prior to giving the go ahead on this solution.

Firstly, can we not improve the present system to allow treated effluent to be used as irrigation water for the area without expanding the volume it can handle? If we can this would be a viable alternative. The farmers would be quite happy to see this I am sure and between them and the food processing industry in this area there is enough cooperation to explore this possibility without additional funding from the government. If we did need additional input on whether we could use the present facility without the expanded capability we should look to both the water districts in the area, M.I.D., T.I.D.,O.I.D., and Del Este Water Co., (They all have a vital stake in the decision, environmentaly and commercially.) and to the other major industries in this area because they provide the jobs for additional people this will affect.

p. 1 of 2

Secondly, if we have used all the available technical data to objectively view this project, is it researched enough? Why can't we poll the public in the city a little stronger? The Modesto Bee supplement of 6/25/79 is the reason I am writing, it was very effective in its appraisal of the situation and quite candid in explaining the effects of this improvement. Thanks to your office for this. But I am afraid public apathy is a strong wall to breach and this matter is important enough for a vote from the people of the whole city. Would your office give the city a viable estimate of what a 6 month or 1 year delay would cost? This would allow time for a vote on the matter. I know it has been publicized enough probably, but some of us don't look closely enough at the myriad of statements regarding environmental impact as we should.

Thirdly, if we need additional research why not look to the people or class of people who will be affected by this decision. The children in the schools, colleges, and kindergarden classes of the city and county. They have to live in the future urban area. They have to work with our actions now when they become our age and pay the taxes which will run this projected expansion. I'm sure the 4 high schools could provide useful and intelligent input from their respective agricultural divisions, science divisions, and the political and social science departments to further analyze what action is taken. Modesto Junior College has a fine agriculture and science department to assist in alternate action.

In summation on my comments, I believe this city and this whole area is rushing to fast toward expanding their ability to effectively accomodate additional residents. I believe this project should not be undertaken at this time because the citizens of this city have voted on an issue which directly affects this expansion and the E.P.A. should make this application for the grant only if the city undertakes a vote from its citizens for prior approval. Proposition A of our last city election gave Modesto and Modestoans their choice on how and when to expand this city and this is just part of that process.

Sincerely yours,

WS Light

W.S. Light
1609 Radcliffe
Modesto, CA. 95351

cc: Modesto City Council
Modesto Public Works Dept.
League of Women Voters
Modesto Bee
State of California , Water Resources Control Board
Stanislaus County Farm Bureau
Stanislaus County Board of Supervisors
Stanislaus County Health Dept., Environmental Health Div.

Response to Comments by W. S. Light. The capacity analysis presented in the Draft EIS has been significantly revised during development of this Final EIS; see Chapter 3 (System Capacity Following Completion of the Proposed Project and Projected Sewage Flows) and Chapter 4 (Growth Accommodated By the Proposed Project).

Existing water quality problems at Modesto's treatment facilities are due in part to insufficient capacity in certain facility elements. Unless the city imposes a total moratorium on new development, failure to provide some additional capacity increase would lead to future water quality problems even with effluent reuse for agricultural irrigation. Major new treatment facilities would be needed to allow the Modesto facilities to supply treated effluent directly to the major water districts in the area (see Chapter 3, Secondary Treatment and Effluent Disposal Alternatives).

May 15, 1979

(HE-153) 1

U.S. Environmental Protection Agency
Attention: Hearing Office, HE-153
Region IX
215 Fremont Street
San Francisco, Calif. 94105

The EIS on the Modesto Wastewater Facilities Improvements is readably written in general and comprehensive. My special interest is in the section on possible mitigations of loss of prime farm land, and your analysis of each will be helpful in guiding local decisions.

My concern is with the very last sentence in the section on agricultural land conversion in Chapter 5. On Page 181 in a summary referring to the matrix on the next page, Table 5-10, it states "measures which are noted in the column titled 'adverse side effects' are expected to be counterproductive to the objectives of agricultural land preservation because they encourage spillover development."

That chart shows a mark on limitations on land zoned for urban development, number of building permits, and industrial growth generators, establishment of high minimum lot sizes in rural areas, maximum lot sizes in urban areas, infill developments in urban areas, prohibition of subdivisions on unincorporated lands, new towns and satellites, purchase of remainder interest, and financing agriculture with non-farm capital.

With the exception of the last three, which are unproven techniques, all of the practices are currently accepted methods generally considered to be good planning. To discard them solely on the basis that any attempt to manage urban growth must be avoided in order to prevent any spillover seems to turn the intent of the EIS upside down. Indeed, we were told by an EPA spokesman at an informational session that Sacramento had received approval by agreeing to return a large acreage of urban reserve to agriculture and to seek infilling and higher density use of developing areas.

I can't believe you mean to proclaim in this EIS that it is better to let urban spread be uncontrolled than risk potential spillover from one area to another. The discussions of possible adverse side effects are reasonable parts of pro and con arguments to be weighed for each mitigation measure, but the negative finality of that concluding sentence seems most misleading.

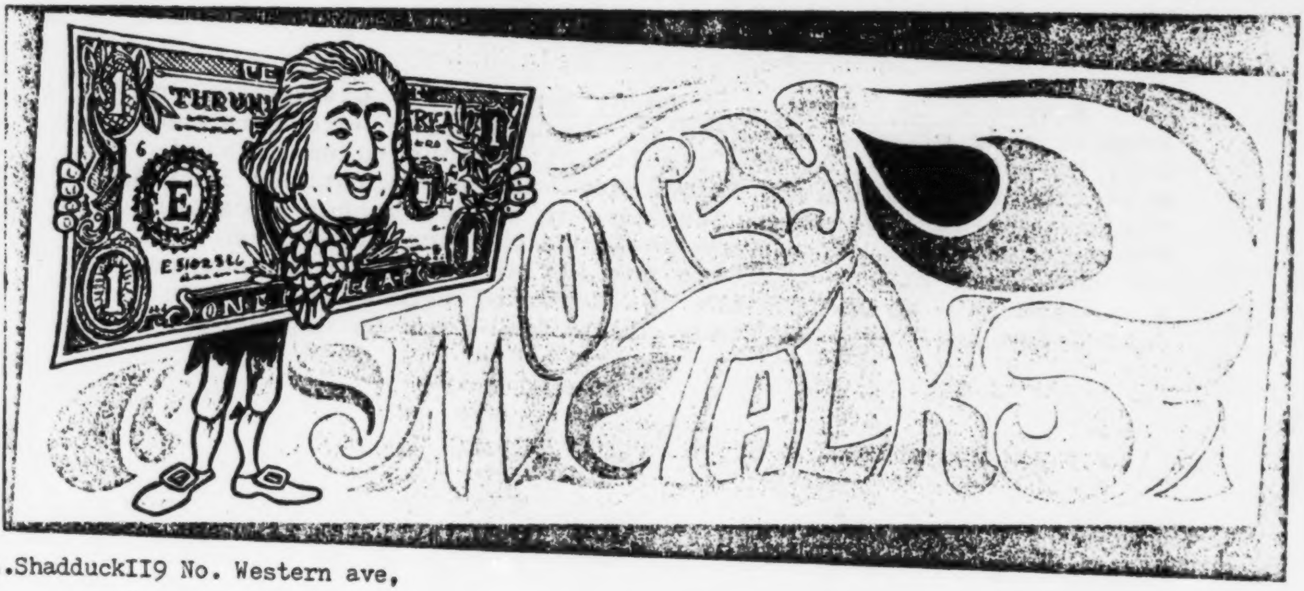
Sincerely,

Peggy Mensinger

Peggy Mensinger
1320 Magnolia Ave.
Modesto, Calif. 95350

Response to Comments to Peggy Mensinger. Discussions of adverse side effects included in the Draft EIS were intended only to point out that the results of actions taken to minimize the urbanization of prime farmlands may sometimes include the displacement of urban development to unforeseen locations. The discussion of mitigation measures has been rewritten for the Final EIS to indicate the situations in which adverse side effects - primarily the spillover of urban development onto prime agricultural lands elsewhere - may be expected.

(HE-153) 12



E.A.ShadduckII9 No. Western ave,
Waterford calif. 95386

June 30 I079.

Subject.
Ⅱ.S. Environmental Protection Agency
Region Ix
Attention Hearing Office HE I53 2I5 Fremont Street San. FRancisco Calif 94I05

Dear Sirs: My mame is Enoch Shadduck and I know live in Waterford near Modesto and can see the things that are happing to the valley land. I have wrote a story of what should be done and if something is not done we will all be more sorry then we are now.

Look it over and I will ask you to excuse my mistakes as I am a I00% naveldisabled vet. and my hand are partly paralixed and I cant make them do as I want them to do.

So I guess you will understand and if you want to you can have a girl retype the materal so it will be more presentable to the highter edyoucated people and it might make a better showing.

Very Truly Yours
II remain
Enoch a. Shadduck

Now the fasting growing thing in Calif. is Modesto and it sits now on the best land in Calif. and a dozen or so new subdivisons are going in now and where it will stop nobody knows. After the prime land is blcktped, guttered, roofed, and familys with several small children, then there comes more schools, sewers,water pipes, stories, and then more taxes, then a grear big yawl about the taxes are t highn as is. Then comes the time to see if that montrosity can be annexted to th city of Modesto and of course they dont want the thing as they are now calling t them that. They have a vote and it just bearly passes so you can see it is no wanted.

Now what to do next, wring your hands enstead of of your neck, it is not to big a job. Every new home that is to be buildt from now on should be Just of Waterford to La Grange to Coulterville to wearnerville and interer an train abou like Bart in Oakland that woud start in Tracy to Modesto to Empire to Waterford to La Grange to Warnerville to Eugine toOakdale to River Bank to Escolon and on to Tracy. This train would put aworker from Tracy to Coulterville in ten/ fifteen mins. Think of the thousands of outos that would be left in family garage. The smog problem would also disappear. There would be suttle busses going to and from the stations. Awhole new complex of schools would be buildt in amuch better manner then they are now. There would be planed housing tracts and say just for ones that do not want any thing that looks like a animal. they will be in sectio where each family will have a fine vegetable garden, a chicken pen that is up of the ground, two cages of six chicken each and also a meat chicken cage, a rabbit hutch ; and nurers can fernish two or more geese or ducks and a turkey or two. Now you people that says they stink and they cant have them, well they dont if taken care of and cleanded at regular times. there may be a horse corrol and a cow barn, the horses for riding and the cows for comunity milk.

Think how much a place like that would do for a lot of ne wayward children yhat was caused by nothing to do but street bum.

In a recent servay thousand of school children were asked what they wanted most in there li ves and 70 % said HARD WORK so that is what they need is more work and less play time. Just think of the thousand of hours that it would take amoung the numbers off children to care for the thousand of animals and the nolag e they would learn on the caring of them. Think of the gardens that would supply wonderful vegetables for the family larder and the egges the meat for the tables.

Afew hundreds lbs. of meat from the duckes, geese, rabbets and meat chicken the care to eating age and they would learn that a animal was to eat and not to be just played with.

Then after a close distroved orchard is put into housingand they get to wanting new schools, fire departments, police ect. they then began to haller for annextion and the old city does not want them and a vote is taken and it may pass by a few votes, and then a short time later a nother subdivision will began to haller for acceptence, and the county will say the sewer system is not big enought and we have to add a sewer tax. A great big cry will go up that taxes are too hight already.

Every new home that is to be built should be some playse between Waterford and Coulteville and Wanerville. There is space enought there to last for the next age.

There would be a inter erban train about like Bart in Oakland Calif. and it would run between Tracy, Coult. Wearer. in a loop that would get each person to work in ten to fifteen min. And back home in the same time. Of course there would be a number of suttle busses to and ffo. how nice to notice thousands of cars in there garages at home. The smog rate would drop to almost to zero.

Each home would be planed,so that each famely would be in azone that sutted them, like each family would havetwelve chickens for egges and meat, ahutch of rabbits, and instead of a dog the comunity would have a pig, which are cleaner than adog. There could be a planded a horse and cow or beef carrol. Dont laugh these animals would be cleaned daily by the school children or be taken from them and geven to the wans that want them. Each family may have a garden to supply them with all the vegetables they can use.

The day of know return is here now, and ~~such~~ something has to be done in the near futureor all of the prime land will be takenand we will find America with not enoughfood to take care of our selves let alone lots of the other worlds.

These new citices can have mames like Rock City or rock Pile, or extenednames like the towns they are near.

Just think of the fun the children will have taking care of the great number of animals and to see how nature works. Think of the number of children that will not go to jail on the accunt of being raised right. At each porton of land there will be a rideing stable and each child thats wants to ride will have to do so much work. Nintynine % of all chrildren will want to take part in thes activies. The schools can be left where they are as the intererban train will have them at the school in ten minutes and this infurneal bussing will come to a stop and the busses that are belthing smog will be sold for junk.

There are many more things that could be added, but the enjouners willwork that out.

One of the most important things that every house shoyld have now is a roof wind turbine ventilators and a hall way fan to blow into the attic,that would save each home owner about $150.00 a year on gas and oil and a electic bill. I know as I have them on my houses and they are just wonderful.

Now there is a area just east of Waterford to La. Grange to Coultleville to Wornerville to Eugine back to Oakdale. In this area there are a few thousands of acers that takes ten acers to foeed one cow as one acre in or near Modesto will feed ten cows to thr acre.

Now we start with our engineers and in this area build roads and from Tracy to all the towns a rapoid transit system like Bart only have it as affective as the rail roads in Japan. Also move or build all new manufacturing plants up there and all the new schools and stors and every thing else

Now you could get on a rapid transit train at Tracy and be in Coultryville in ten minuts and then back to Oakdale to Riverbank to Tracy in another trn minuts.

There would be tracks set up there and each family could pick out the track that they wanted. Such as one section would havea~~no~~ home and garage and a lorge back yard and in this yard would be awired chicken coop with about ten hens in it and on top of that a rabbit hutch. Each child could h ve a garden to raise vegetables in and if the chidd would not take care of the things he would ther have them taken away. In this section there woulld be a stable for horsesand a riding acadimyfor th section. On the pther sections they could have what they voted for like just a smoll garden and not ing else.

Can you see that there would be thousands of cars left in the garages as the school personal would be picked by the intererbin trains and a few small buesses would take the workers train stat ion and the workers would ride them to and from work and be on the job in ten to fiftren minutes.

What a wonderful place that would be for the children to grow up on. Aresent servay wes taken asking the children what they wanted most and seventy per cent said work and some thing construckiv How about the gardens that would supply food for the familes and small orchards the berry patches and other hobbies that could be added by the dozens.

Now there could be a whole book wrote on this subject and I think there has been,bit all the wri ers just go around in circles and dont come up with any thing that would work or it hasent been published as yet. About all that I have read is just like a round ball,round and round and no corner to jump off on.

Now any body that has a mind that can add up to three and three knows it is six andIf the urbin blight dose not stop we well know that all the land sutiful for agueculture will all be under black top. Now when that time comes and it is here right now and we try to farm the rock pile up around Warnerville there is goimng to be a lot of dul plow sheares and we will not be able to feed o our selves let alone the rest of the world. So that will make a few more million children starve to death. So lets get on the ball and at least start a planing board to put the wheels in motion.

I Thank you for your time and am glad that some body put this in the papers so a few people cpuld read it and at least give a few answers

I remain Enoch A. Shadduck
II9 No. WEstern Ave
Waterford calif.

(5336

Response to Comments by Enoch Shadduck. The concept of new towns or satellite towns was discussed as agricultural land mitigation measure C(5) in the Draft EIS. This concept was also discussed during the city's alternative futures symposium in early 1978. There are major political, institutional, and financial problems to be resolved before such concepts are implemented.

(HE-153) 12

229 Downey Ave
Modesto, Ca. 95354
July 24, 1979

U.S. Env. Protection Agency
Hearing office HE-153
215 Fremont St.
San Francisco, Ca.

To whom It May Concern;

I attended the meeting held June 27th in the Modesto City Council chambers but was unable to stay after the recess. I was sorry, for I am vitally interested in preserving our prime farm land and environment.

Our family has been here since 1849 on my father's side, my husband's father came in a covered wagon and we have relatives over all the state.

The sewer bonds we voted for in the 60's was to benefit Tri Valley cannery as they had threatened to move out if it wasn't passed, and we would lose one of our most valuable agricultural employers.

Modesto survived the 30's depression better than most towns due to its agriculture which gave employment and kept our economy stronger than most.

I do not want our prime farm land to disappear to make way for useless polluting industries and "ticky tacky houses" that won't survive their mortgages.

II

The last 10 years our City was run mainly by promoters, builders, and real estate people out to make a fast buck and our ex Mayor Davis and his yes men in the City Council.

We helped the situation by working hard to elect Mrs. Peggy Mensinger mayor and Measure A passed. It makes a vote of the people (advisory) before sewers can be extended. My husband passed away last Sept. so I worked hard for both the mayor and Measure A. That helped, however, no election was held to fill her vacant Council seat, and the opposition slyly worked in another yes man to fill the seat so it's 6-2 once again — so we really need the Environmentally Concerned agencies "to get tough".

If you've read this far thank you, I truly appreciate it. I know we need the sewer but hope it won't signal a "go ahead" again for the "fast buck boys" again. It should have some curbs put on it. I wish wet industries, polluting industries and urban growth could be limited or the Valley will be like Los Angeles. We get smog from burning in Yolo County, Stockton, etc. North of us & south of us gets ours in addition. The Mts enclose us and with the energy crisis the air quality standard may be lowered to the Federal level which can't be right for some areas like ours.

Modesto's cost for the sewer plants will be 20% of 12.1 million, plus operating and maintainance costs. Will the farmers using the treated effluent be subsidized by us to some extent - I imagine they will pay for using the water? There are many questions unanswered but I suppose its all decided. Its hard for people who live elsewhere to really understand all of our cities problems - some you learn "just by living - not from reading or college".

I would like it to stay agricultural and to grow carefully enough to protect the quality of our life and environment.

I have no monetary interest - no axe to grind - "just a love for our town"!

Sincerely yours,

Mrs. Cyril L. Wootten
(Lorene)

Response to Comments by Mrs. C. L. Wootten. As presently envisioned, the City of Modesto would deliver treated effluent to irrigation users at no charge. The 1976 and 1979 project reports indicate that it is less costly for the city to pay the operating costs for the effluent distribution system than to pay for operating a new treatment system that would allow river discharge of the treated effluent.

Comments From Interest Groups

Joe Good, Modesto Chamber of Commerce. Public hearing comments: The EIS does not give adequate attention to economic and employment impacts, especially those of the no project alternative. Closing the canneries would seriously impact the local economy.

Response. The EIS explains (page 87 of the draft) that the city is not likely to be able to finance sufficient improvements to the wastewater treatment system to be able to upgrade the effluent to meet discharge requirements; however, if the canneries were to remove their discharge from the city system and provide their own treatment, the city might be able to meet the requirements. Thus, the EIS does not suggest that the canning industry should be eliminated, but rather, if the project were not funded, that the city might have to ask some canneries to seek alternative treatment arrangements for their wastewater flows.

Russell Harrison, Building Industry Association of Central California. Public hearing comments: What is the base year for the 10- and 20-year project design periods -- 4 years ago or the present? What is Modesto's obligation, as a regional plant, to serve surrounding urbanizing areas such as Empire, Hughson, etc.? Who paid what share of the costs? What are the obligations of these surrounding communities in negotiating contracts or agreements with Modesto? Who has the ultimate authority over connections to the Modesto plant?

The adopted air quality maintenance plan mitigates the air quality impacts of the project. The City of Modesto should not be responsible for agricultural land mitigation measures which require action by other local, state or federal agencies. The city is already implementing many of the measures listed for city action.

Response. Clean Water Grant program regulations allow the 10- and 20-year project design periods to be based on the estimated start of project construction. The 1976 project report used 1977 as a base year while the 1979 project report supplement on the irrigation reuse aspects of the project used 1979 as a base year. The design basis for the primary plant site improvements has not yet been changed. Detailed design work for the proposed project has not yet been done. The design year and population forecast basis of project planning could be revised if the City of Modesto requests such a change before receiving "concept approval" of the project from the State Water Resources Control Board and EPA.

The "Basin Plan" (California State Water Resources Control Board, 1975) does not specifically identify the Modesto wastewater treatment plant as a "regional facility". It does, however, identify the City of Modesto, City of Ceres, Hughson Sanitary District, and Waterford County Conservation District as a "municipal discharger group". The Basin Plan calls for municipal discharger groups to prepare subregional water quality management plans which evaluate, among other things, the feasibility of consolidating separate facilities. The State Water Resources Control Board has responsibility for determining which discharger groups require a subregional plan. No such plan has been developed for the Modesto-Ceres-Hughson-Waterford group.

The City of Modesto has no obligation to provide sewer service outside the boundaries of the Modesto Municipal Sewer District (the current sewer service area). Other areas can (at Modesto's discretion) receive service through appropriate contracts or other formal agreements with the city (the Empire Sanitary District is served through such an arrangement). Such arrangements must be initiated by the agency desiring service through Modesto's facilities.

Revised discussions of prime farmland and air quality mitigation measures are presented in Chapters 5 and 6.

Laurence H. Martin, Allied League of Voters. Public hearing comments: What portion of the project is for growth accommodation as opposed to water quality improvement? A recent newspaper article makes it sound like the EIS is the device for resolving air quality issues. A great amount of effort has gone into the locally developed air quality maintenance plan. It is inaccurate to justify the EIS as a mechanism to deal with air quality problems. Most mitigation measures for prime farmland are federal or state actions. Many of the local measures are already adopted. Hopefully the prime farmland issue will not repeat the air quality maintenance plan process, where a locally developed program has been shelved in the name of a uniform national approach. The city is the agency with a major stake in this project, but growth impacts have been analyzed on a larger geographic basis. The city cannot implement a mitigation program for all of this larger impact area.

Response. Table 17-2 indicates the extent to which various elements of the project serve a capacity increase function. Overall, about 38 percent of the estimated capital costs are related to capacity increases. See also the discussion in response to the comment letter from Alison Goss and Myrtle Osner of the League of Women Voters of Modesto.

Table 17-2

FACILITY ELEMENTS SERVING A CAPACITY INCREASE PURPOSE (INITIAL CONSTRUCTION ONLY)

Facility Element	Estimated Capital Cost[1]	Percent Related to Increased Capacity	Capacity-Increase Portion of Cost
Influent Pumping Plant[2]	$ 1,136,000	100%	$ 1,136,000
New Primary Effluent Pump[3]	29,000	33%	9,600
Booster Pumping Plant[2]	462,000	100%	462,000
Sludge Thickeners[4]	1,214,000	45%	546,300
Sludge Digester[4]	1,259,000	45%	566,600
Sludge Drying Beds[4]	300,000	45%	135,000
Control Building Enlargement[5]	97,000	0%	0
Miscellaneous Improvements[5]	65,000	0%	0
Primary Plant Subtotal	$ 4,562,000	63%	$ 2,855,500
Additional Floating Aerators[6]	525,000	0%	0
Chlorination/Dechlorination Facilities[6]	290,000	0%	0
Effluent Storage Pond[7]	1,175,000	23%	268,700
Lift Station[7]	77,000	23%	17,600
Drainage Pump Station[8]	158,000	0%	0
Irrigation Pipelines[7]	3,125,000	23%	714,700
Irrigation Pump Station[7]	469,000	23%	107,300
Remote Facilities Subtotal	$ 5,819,000	19%	$ 1,108,300
Total Capital Cost[9]	$10,381,000	38%	$ 3,963,800

NOTES & SOURCES:

[1] From Jenks & Harrison, 1979.

[2] Facility element is not a replacement unit, is flow-related, but has no water quality function. Thus, this element is considered 100% capacity-related.

[3] Replacing a 100 horsepower (0.25 million gallon/hour) pump with a 200 horsepower (0.83 million gallon/hour) pump. Because of pressure limits in outfall line, reliable capacity (one 200 horsepower pump on standby) is increased 33% (from 33.2 MGD to 44.1 MGD).

[4] Based on data in Jenks & Harrison (1976) which shows 55% of the new sludge digester capacity will be used to meet 1977 overload problems. Identical capacity increase percentages used for all sludge processing facilities.

[5] These elements are not flow-related.

[6] Although flow-related, these elements are judged to be water quality improvement features, not capacity-related features.

[7] Based on Jenks & Harrison (1979) projection of 23% total annual flow volume increase between 1977 and 1989.

[8] This element provides effluent to the Chase Ranch. Since the Chase Ranch has unrestricted rights to plant effluent (as part of prior condemnation proceedings when the oxidation ponds were built), this element is not considered capacity-related.

[9] Jenks & Harrison (1979) estimates an additional $1,200,000 cost for engineering services, $15,000 for legal, fiscal and administrative services, and $500,000 for a project contingency fund. Thus, total construction costs (least cost alternative) are estimated at $12,096,000.

Chapters 5 and 6 present revised discussions of mitigation measures relating to prime farmland and air quality issues.

The EIS recognizes that the city cannot control land absorption or land use patterns in the area outside its sphere of influence. Thus, the EIS limits its forecast of agricultural land absorption to the Modesto Ultimate Sewer Service Area (USSA) and the population expected within that area. Similarly, the evaluation of the effectiveness of the Modesto mitigation program, described in Chapter 5, considers only the land within the USSA, which would be affected by decisions made by the Modesto City Council.

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27 June 79

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June 22, 1979

Mr. Harold Bissell
Jones & Stokes Associates, Inc.
2321 P Street
Sacramento, California 95816

Re: Modesto Wastewater Facilities Improvements
Environmental Impact Statement

Dear Mr. Bissell:

This letter is submitted in connection with the comments on the Draft Environmental Impact Statement prepared by E. P. A. on the above-referenced project, prior to the public hearing on June 27, 1979, at Modesto, California.

The issue addressed herein is one pertinent to the responsibilities of E. P. A., the California State Water Resources Control Board, and the City of Modesto under the Federal Water Pollution Control Act amendments of 1972, P. S. 92-500, and specifically Sections 201 and 208 of said statute. The issue is what responsibility does the City of Modesto have under the Clean Water Grants program, as a "regional" sewer treatment facility, to accept or receive sewage from cities which may be unable to adequately treat sewage generated within their own areas and, by qualifying for Clean Water Grant funds, may have no other feasible alternative but to consolidate with the facilities of a regional wasterwater treatment plant. This issue is not addressed directly by the Facilities Plan or the Draft E. I. R. However, it is within the ambit of a number of traditional aspects, or assumptions regarding the size and scope of the proposed improvement (i.e., planning for reserve treatment capacity, projections as to the pace and direction of growth and trunkline capacity. Moreover, it may come within the scope of E. P. A.'s particular concerns which motivated the need for an E. I. S. regarding growth and its impact on prime agricultural farmland.

As background, the undersigned represents a group of homeowners in the area of the sewage treatment plant operated by the City of Hughson, a small incorporated city about seven miles southwest of the City of Modesto. The Hughson treatment plant is inadequate to handle existing sewage flows. Since September, 1977, the City of Hughson has been subject to a cease and desist order of the California Regional Water Quality Control Board, Central Valley Region, to prevent odor and nuisance. Prior to that date, the city had commissioned a grant-funded study to obtain recommendations for upgrading its wastewater treatment facility. The city rejected the initial proposal due to cost reasons, and attempted to proceed with a low-cost alternative project opposed by my clients. This project was rejected by the RWQCB; at about the same time, we also obtained a writ of mandate in Superior Court requiring the city to comply with CEQA environmental procedures. The city then commissioned a second study, which came up with new data and information on six project options, four of which involve consolidation with Turlock or Modesto. The City is seeking a Clean Water Grant to fund improvements, and is currently conducting preliminary hearings on its own Facilities Plan and Draft Environmental Impact Report.

The city project engineer and representatives of our group have had meetings with Modesto city officials on the subject of availability of trunkline and treatment capacity to handle current flow volumes of 0.65 MGD and a projected flow volume of 1.09 MGD in 1995.

Upon Hughson's first inquiry in late 1978, Public Works Director, Ross Campbell, indicated available reserve capacity of approximately 1.50 MGD, which reserve capacity has now been lost through the agreement between the Cities of Modesto and Ceres as to the "No Man's Land" area (i.e., Ceres will have jurisdiction over the land in question but will be able to utilize the sewer trunkline and capacity served by City of Modesto's treatment system).

Modesto's position, in response to further inquiries, has been that it has no available capacity for collection in the system designed in connection with this project (for 1982-1983). Hughson's alternative, then, as far as Modesto sees it, may be to treat its sewage and pump the treated effluent directly to outfall lines near Carpenter Road, south of the Modesto treatment plant. This analysis is founded upon three assumptions:

(1) No available reserve capacity at the Codoni Road outfall line (which serves the Beard Industrial Tract);

(2) No available reserve capacity at the Yosemite/Lincoln Avenue outfall line, due to reserve capacity for a population of 30,000 in the Empire area (now outside the CSAA but inside the USSA).

(3) Even if capacity is available at Codoni Road, it may require some yet unspecified "buy-in", or "buy-out" of taxpayers within the Modesto Sanitary Sewer District who have been taxed for a long period of time to finance sewer improvements and this reserve capacity.

As a practical matter, Modesto's officials have acted to protect their reserve capacity for Modesto users, a quite understandable response. However, several other matters should be noted:

1 - The above-referenced Federal Water Pollution Control Act amendments, particularly Sections 201 and 208, have set forth federal policy in making grant funding available: Small cities should consolidate with facilities at larger regional cities to provide better treatment of sewage and the most economical use of federal sewage treatment dollars.

2 - The SWRCB, in its Basin Five Plan, set forth California's policy interpreting the federal statute: Consolidation will be required unless technically or economically infeasible.

3 - The Stanislaus Area Association of Government (S.A.A.G.) has recognized that Modesto's treatment plant is regional, and should serve outlying areas such as Hughson (1974 Report).

4 - Certain events and circumstances may occur that will upset assumptions regarding the future use of reserve capacity, including (a) a decision

not to extend, or to delay extension of the Yosemite trunkline; (b) post-Proposition 13 funding for "infrastructure" city services to new areas outside the CSSA; and (c) re-evaluation of the propsects for attracting new "wet" or other industrial users to the Beard Industrial Tract, based on a number of factors, many of which have been raised in the EIS.

Because this problem is one which faces cities like Hughson and even unincorporated areas both within and without Modesto's sphere of influence, and because federal taxpayers' funds are involved through the Federal Clean Water Grant program, my clients request:

1 - A reaffirmation of Modesto's responsibilities under P.L. 92-500 and SWQCB's Basin Five Plan with respect to terms and conditions of acceptance of wastewater from outlying cities or unincorporated areas.

2 - A statement of procedures and policies for resolving collateral problems, (e.g., regarding Modesto Sanitary Sewer District, joint powers agreements, etc.).

3 - A re-evaluation of the availability of "committed" reserve capacities in the near-term based upon the premise that events listed above should occur to free capacity.

4 - An evaluation of the possibility of including Hughson's projected flow of 1.09 MGD in the 1982-1983 projected improvements.

The acceptance of sewage from Hughson may also have impacts upon the urbanization concerns expounded in the EIS. Specifically, Modesto should address the effect of: (1) a straight line connection to the Beard Industrial Tract at the Codoni Road outfall line and (2) a connection via Empire and Yosemite Boulevard, either parallel to or in connection with the Empire inflow line. In our judgment, such connections would not have a significant urbanizing impact, or if so, such impact could be mitigated by conditions or limitations upon flow volumes to be accepted by Modesto from Hughson.

We will appreciate your addressing this matter or referring it to the City of Modesto for response.

Very truly yours,

Charles H Bell

Charles H. Bell, Jr.

CHB,JR:AESefr

Response to Comments by Charles Bell, Representing A Group of Hughson Area Residents. (Mr. Bell's comments at the public hearing were essentially the same as those in his letter.) The obligations and responsibilities of various parties seeking sewer service from the City of Modesto are discussed above in the response to similar comments made by Mr. Russell Harrison. The City of Hughson is presently investigating the possibility of consolidation with Modesto's facilities.

7

Exhibit 11
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Immediate expansion of Modesto's Wastewater Treatment Plant is critical. Modesto has already reached the point where it cannot meet State and Federal clean water standards. Moreover, it is very doubtful that existing facilities could adequately serve the Current Sewer Service Area should infilling be successful in utilizing 100% of the presently vacant land.

Because of the importance of these two conditions, the Directors of the Modesto Board of REALTORS support the proposed expansion. We feel the need is severe enough to warrant Federal and State assistance in this project..

We are aware of EPA's two responsibilities in this area, the first being assistance of communities in attaining compliance with clean water standards; the second insuring that the effects of such projects on ag-land conversion be mitigated to the extent feasible.

Obviously these two responsibilities conflict - balancing them is no easy task. In order to assist EPA in performing this balancing act we have responded to the various mitigation alternatives outlined in the EIS. Some of them we think can work, others we do not. Hopefully our comments, along with others you receive today, will give you and the City of Modesto the kind of guidance which will enable the two agencies to reach a workable medium.

We will address our remarks strictly to those mitigating measures which can (according to the EIS) be implemented at the local level.

A - 1: Limit the amount of land zoned for urban development.

Modesto/Stanislaus County land use policy for maintaining the exclusive agricultural zoning on unincorporated lands has virtually halted rural subdivision activity. This has been no easy political achievement. Some of the most difficult political decisions made are made by Supervisors as they weigh individuals' rights of property ownership and myriad of exceptional circumstances and hardship against public benefit of ag-land preservation.

Ironically it is this very effective policy of ag-land preservation which has helped worsen Modesto's sewage treatment problem. Every policy has side effects, and one of the side effects of this one is the increased demand placed on urban services as people are funneled into those urbanized areas instead of being allowed to spread out into neighboring unincorporated land. Instead of subdividing unincorporated land with the use of septic tanks, subdivisions must take place in the incorporated areas of the County where sewer service is a requirement and now - a problem.

We think this policy is sound in concept and should be recognized as one of the most advanced and effective in the State.

A - 2: Limit the number of building permits.

While some jurisdictions have enacted this measure, we believe it is a simplistic response. The result is increased housing costs. Thus it is a highly discriminatory policy. Implementation gets very complex: Who gets the permits? What will the commercial/residential/industrial mix be? As the EIS points out, if housing demand exceeds building permits (obviously this would be the case, otherwise why have a limit?) new con struction will merely be relocated.

A - 3: Limit industrial growth generators.

EIS is incorrect inits assertion that Modesto has enough land zoned for industrial use to accomodate all growth projected through and beyond the year 2000.

Over 73% of that industrially zoned land lies within the Beard Industrial Tract. The owners of this land are understandably very selective as to who is allowed to purchase or lease that land, however. In other words, experience has demonstrated that that land is available primarily if not solely to rail users.

An im balance exist locally between supply and demand for industrial land not requiring rail use as a condition of ownership or tenancy. In comparing industrial land prices in Modesto to other nearby cities (Stockton, Manteca, Tracy), we find that unimproved land sells in Modesto for 2 to 4 times that located in those other cities.

B - 1: Low minimum lot sizes in urban areas.

This is a positive measure which could do much to conserve land and reduce housing costs. We encourage the City of Modesto to seriously consider reducing the minimum lot size of all residential dwelling

B - 2: High minimum lot sizes in rural areas.

B - 3: Maximum lot sizes in urban areas.

EIS points out that while minimum lot sizes are typically spelled out in zoning ordinances, rarely do they mention maximum lot sizes. We believe local agencies have correctly guaged public sentiment on this issue. Maximum lot sizes unnecessarily restrict ownership rights, particularly here in Modesto where a variety of housing types has long been sought. Market forces (as influenced by Modesto's land use policy) automatically conserve land use. This is evidenced by what some perceive to be the need for minimum lot sizes, i.e. without them lots would surely be smaller than seen at present (smaller lot sizes, of course, are viewed as undesireable by some).

Rather than remove prerogatives of ownership in the name of public welfare, we should increase those prerogatives by reducing minimum lot sizes and easing setback and other development conditions. The same ends will be achieved - increased density - and probably more successfully with the latter policy.

B - 4: Minimum neighborhood densities in urban areas.

As stated earlier, we feel that to a great extent mitigation of ag-land conversion can best be achieved through incentives. Instead of mandating density, make higher density projects more attractive to the developer. Reduce street widths; amend curb, sidewalk and gutter requirements; amend setback criteria; amend height restrictions; allow cluster development as a matter of right. If it's easier and cheaper for the developer, likewise for the consumer. The ongoing consumer shift toward this kind of housing will accelerate if such housing is given a competetive edge, thus increasing density.

The market has proven its ability to increase density without government interference - provided the higher density alternatives are available and provided the public wants them. The City of Modesto report, "Land Use in the Modesto Urban Area: 1976" states that "duplex and apartment dwellers in the Modesto area currently prefer low density development, as do single family home owners." That condition is rapidly changing. Modesto's Director of Planning and Community Development has predicted a dramatic upsurge in cluster housing applications in such numbers as to overshadow conventional single family units. However if this movement is not proceeding fast enough, then consideration should be given to some of the positive measures we have suggested.

B - 5: Infill development in urban areas.

Obviously this process is occurring in Modesto. However we wish to point out the "negative" method by which this end is attained. We say negative because infill is prompted totally through the "discouragement" of urbanization at the fringes. By withholding some of one owner's property rights (denial of development right due to agricultural or large lot zoning), the City and County direct urbanization to other parcels.

We have already expressed our support of the present land policy concept. We have also noted that infilling is proceeding well in Modesto. However we believe that with some encouragement the rate of infill could be increased, thus relieving some of the growth pressure and possibly alleviating the need for some other more stringent mitigating action.

Again we suggest that if infill is indeed a highly desireable trend, then the community should be willing to look upon such projects more favorably than others. It is true that in considering infill proposals individual planning commissioners and councilmembers may take it upon themselves to "go easy" on that particular project. However the City lacks an official policy directing staff and elected officials alike to give special consideration - to make "exceptions" if you will - to infill applications. The EIS goes so far as to mention subsidization as a possiblility. Clearly Council's executing such a polich would step up the rate of infill.

B - 6: Cluster development in urban areas.

Modesto has seen a sudden increase in cluster development proposals. One method, among others, of shifting to more development of this type is to allow it is a matter of right - in other words eliminate staff, commission, and Council review. Obviously the development that would take place under this scheme would not be as "ideal," by staff's definition, as that obtained under the current review process. If greater land utilization is important enough, however, then it is an option worth implementing.

B - 7: Cluster development in rural areas.

C - 1: Growth on or toward non-prime lands.

Certainly the quality of soil on which urbanization may occur should be a consideration in determining where a city should grow next, and in Modesto this is a major one. (see EIR Yosemite Trunk) However, to place this factor above all others is to ignore many other, often more important considerations.

A council is elected to make and carry out certain policies on behalf of its constituents. It should be left free to base decisions on the particulars of each situation. The authors of Measure A, the newest amendment to Modesto's growth policy, understood this and so asked the voters to approve only an advisory rather than binding election on sewer trunk extensions. Instead of junking our elected body in favor of inflexible rule, let's require that this factor always be taken into consideration yet allow them that independence we want them to have.

C - 2: Prohibition of subdivisions on unincorporated lands.

As we mentioned earlier, this policy is a good one in concept. As drawn in Stanislaus County, it is a little on the inflexible side. For example: In order for a parcel split to be approved, the Board of Supervisors must make a finding that the proposed split will serve an agricultural purpose. We think that by changing the required finding to one that finds the proposed split as not jeopardizing an existing viable agricultural operation, needed flexibility will be introduced to the law while retaining its intent.

It is conceivable, in fact not too unusual, that such findings can be made with regard to subdivisions.and cluster develpment on unincoporated lands.

C - 7: Agricultural element of the general plan.

The addition of an agriculture element would do little, if anything more than that already accomplished by the existing land use and housing elements and policies of Modesto and Stanislaus County.

C - 12: Condemnation or transfer of development rights.

This is an unknown for us, and obviously for a lot of other people too. We think the best posture is "wait and see" how other jurisdictions have made out with this program.

D - 1 and D -- 2: Establish urban service areas for long and short term growth.

Already implemented, this has been a major step for Modesto and Stanislaus County in mitigating the conversion of prime ag-lands.

In summary, the points we wish to emphasize are these:

Modesto currently implements a land use policy which works well. If mitigation of ag-land conversion is the criteria by which our land use policy is judged, then Modesto has to receive a very high rating.

This policy has not come easily. There are critics on both sides of the coin. Some say it is too stingy in its allowance of urbanization. Others believe it does not go far enough in limiting urbanization.

Land use decisions are very difficult ones to make. There seldom is a right or wrong side to the question, only a weighing of desired ends to see which point of view prevails. In this regard the County Board of Supervisors and the Modesto City Council have faced this issue squarely and have made tough decisions - they have not avoided this issue in any way.

The process which has evolved is well-suited to meeting the problems and needs unique to this area. With regard to EPA's concern of ag-land preservation, our land use policy makes this a high priority. It is a factor considered in all growth decisions. But it is rightfully balanced with other important considerations.

Response to Comments by Matt Brodie, Modesto Board of Realtors. (Mr. Brodie's comments at the public hearing were essentially a summary of the Board of Realtor's letter.) The discussion of prime farmland mitigation (Chapter 5) has been revised for this Final EIS.

III-153
27 June 79

League of Women Voters of Modesto
800 EAST MORRIS AVENUE • MODESTO, CALIFORNIA 95350

June 27, 1979

TO: ENVIRONMENTAL PROTECTION AGENCY, REGION IX

FROM: LEAGUE OF WOMEN VOTERS OF MODESTO

The League of Women Voter's wishes to deal with two areas of concern to us at today's hearing. During the past year we asked several questions of the consultants, which were never answered directly, but which, we hope, were incorporated in the body of the final draft.

First of all, we still have questions. We believe that the public should have an answer from the EPA, rather than from the consultants, since these are policy questions.

1) You have stated that the project will result in a 35% increase in total sewage capacity. How much of this increase will serve to take care of the peak-flow sludge-handling problems caused by the canneries? If water quality standards are already being exceeded due to the above cause, why does the EPA consider the solving of this peak-flow problem part of the total growth picture in Stanislaus County, when it is already necessary at present population levels? In other words, if our growth stopped tomorrow, wouldn't the plant still need this upgrading just to stay static?

2) Again referring to the 35% increase in capacity, how much of this will serve the projected new residents, which you estimate as 35,000 to 61,000?

3) For purposes of obtaining the grant, will the reuse of effluent for irrigation, as proposed, be considered as an increase in total sewage capacity, or is it considered a way to upgrade the quality of present, rather than future, effluent?

The second area of concern to us is that of the measures suggested to mitigate the conversion of prime farm land. We would like to point out that many of the suggested mitigating measures, that can be implemented locally, are already in use to some extent. Two-thirds of the measures listed in your summary, however, involve state or federal action, so that the local role in mitigation is definitely limited. As League members we have been concerned for some years that the city and county governments may have demonstrated a lack of commitment to these local measures. We would favor greater commitment, particularly, to efficient public transit both within the cities and between them. The record in this field has been very poor. Other measures which we favor are: higher density within cities, infilling the current sewer service area, more efficient use of bypassed parcels, and the continued development of bike lanes and trails. We do not favor any development unless it is supported by a complete range of "government infrastructure": provision of schools, fire and police protection, etc. We favor development which is contiguous to that already in place.

League of Women Voters of Modesto
800 EAST MORRIS AVENUE • MODESTO, CALIFORNIA 95350

We do have serious questions about the Urban Reserve areas of all the cities. Much of our prime farmland lies within these borders, and as far as we know, all the cities plan eventually to occupy that land. What measures would the EPA require of the cities to save this considerable acreage? And why should Modesto be singled out as the one which must provide the burden of proof? Several other cities within the county will soon be running out of sewage capacity and will no doubt be applying for their own clean water grants.

At this moment, the County has an Agricultural Technical Committee preparing recommendations designed to save farm land, but these measures will probably not affect land within the Urban Reserve. We would recommend that Stanislaus County government be brought into the picture if the EPA intends to enforce any measures to reduce impacts on farm land.

Finally, the League of Women Voters supported Measure A, the Citizens Advisory Growth Management Act, believing that the democratic process might in this way give the people more of a voice in deciding how, or if, their city is to grow. Until this Measure is tested, we will not know whether citizens want their city to continue growing or not. In your EIS you have not considered at all the impact of a vote of the people on whether or not to extend sewer trunks.

Alison Goss
Myrtle Osner

Alison Goss, Land Use Director
Myrtle Osner, President

Response to Comments by Alison Goss and Myrtle Osner, League of Women Voters of Modesto. (Comments by Alison Goss at the public hearing were essentially a summary of the League of Women Voters' letter.) As discussed in the Preface and Chapter 3 of this Final EIS, a significant reanalysis of project capacity issues has been undertaken since publication of the Draft EIS. As noted in Chapter 1 and the Summary of the capacity analysis in Chapter 3, initial project construction will provide a 5 percent increase in facility capacity while planned future construction provides a cumulative increase of 21 percent. Sludge processing elements of the wastewater treatment system are "off-stream", and thus do not serve as a direct capacity constraint. The capacity increase discussion in this EIS is phrased primarily in terms of wastewater processing components of the system. As noted in Chapter 3, the proposed project includes a 59 percent increase in sludge digester capacity, with over half of the new digester capacity being used to handle existing digester overloading problems.

As indicated in Table 17-2 (response to comments by Laurence H. Martin, Allied League of Voters) various facility elements differ in the extent to which they serve capacity increase, water quality improvement, effluent disposal, or other functions. The capacity increases provided by initial and planned future construction are, by definition, available for future sewage flow increases. Increased sewage flows will come from several sources: connection of existing but currently unsewered area residents; increased processing flows from seasonal or nonseasonal industries (due to increased production or new industrial plants); and increased domestic flows from new residential growth. The City of Modesto can significantly influence the extent to which available treatment plant capacity is used by the various sources of increased flows. The population increases which can be served by initial and planned future construction are discussed in Chapter 4 (Amount of Growth).

Actions by the City of Modesto to mitigate impacts on prime farmlands are discussed in Chapter 5 of this Final EIS. Local agency mitigation of prime farmland impacts has focused on the City of Modesto because the city is the agency applying for federal funds under the Clean Water Grant program. EPA's prime farmland policies will also apply to other local agencies which apply for clean water grant funds in the future.

Measure A, passed by Modesto voters in March 1979, requires that an advisory referendum be held before the city council decides whether to extend a sewer trunk line. This measure was designed to give Modesto voters a greater voice in growth issues, and will undoubtedly encourage discussion among voters regarding the pros and cons of sewer trunk extensions prior to each advisory election.

For Measure A to function as a measure to inhibit the conversion of prime agricultural land, the result of advisory votes - and subsequent council actions - must be consistent with preservation strategy. Consistency, in turn, would require that voters (and council) approve extensions which would allow the urbanization of nonprime land or of the prime land most directly between the existing urban area and the closest nonprime land (see Measure C-1, page 133) and disapprove extensions which would allow the urbanization of prime lands that are not in the path toward nonprime lands. To disapprove all extensions would create pent-up demand that would likely result in spillover development in neighboring areas.

YOKUTS GROUP
MOTHER LODE CHAPTER -- SIERRA CLUB

BY E.P.A.
IX
CENTER
'79

re EIS Modesto Wastewater
Facilities Improvements
response.

Modesto, Ca.
July 19, 1979

Dave Jones, Water Division
U.S. Environmental Protection Agency, Region IX
215 Fremont St.
San Francisco, Ca. 94105

Dear Sir,

We support the expansion of the Modesto City Wastewater Facility so the Plant can assume service as a regional plant to include the City of Hughson as a service area. This would not only service an existing area in this regional plant but by removing the Hughson Wastewater Plant from the Tuolumne River it would reduce the destruction of riparian habitat, pollution of the river and keep 45 acres in prime farmland which includes the proposed new Hughson site.

The remaining expansion could be used to increase the density of the already serviced area. By increasing the population density of the already serviced areas you save the cost of expanding pipe lines, pumps and canals into the farmland. We need to stop the urbanization of the farmland. We want to save the 80% of the farmland that is projected to be urbanized by this project. We need to grow up - not out.

Air Quality is a concern. As the higher traffic density reaches the limits of the roads there is more stop and go traffic increasing the amount of petroleum combustion products in the air which contributes heavily to SMOG.

By increasing density in the already serviced area you could build larger apartment complexes and heating a single building is certainly more economical than heating

INVOLVING SIERRA CLUB MEMBERS IN STANISLAUS AND TUOLUMNE COUNTIES, CALIFORNIA

3/ a larger apartment complexes and heating a single building is certainly more economical than heating a spread-out community.

High density population enhances the feasibility of mass transit. Mass transit will reduce SMOG levels and has the possibility of conserving gasoline.

We have several good builders in town who are concerned with quality living and high density, such as Jim Price.

We need to service the Hughson area but not allow more loss of prime farmland.

Industry needs to change its ways to use less wet solid waste. I recommend that we implement a system to increase rates per gallon to wet industry to encourage each industry to reduce the amount of water used and recycle water which would save the energy of the water being pumped, prevent the lowering of the watertable and save water. Water overuse is a critical problem. We must try to eliminate water as a means to move or dispose of food processing waste. It slurried and dried.

Instead of washing all your problems down the drain, dry the waste with the sun and ~~[illegible]~~ use them for mulch or cattle food. It doesn't go to waste - it goes to use. Put it back into an animal or the soil.

3/

Here are some questions that disturb our committee,
We feel #10 is the most important.

1. Why doesn't the City of Modesto grow up - not out?

2. How many gallons of waste would need to be treated
if high density population occured in the existing sewer
service area?

3. What costs would be increased by building going up?

4. What costs would be decreased by density going up?

5. What amount of energy consumption would be
increased by high density development?

6. What amount of energy consumption would be decreased
by high density development?

7. What amount of water would be increased by
high density development?

8. What amount of water would be decreased by
high density development?

9. Why wasn't high population - high density scenarios
included on p. 79?

10. Where does it all end? Where is the balance
that provides the production to sustain an
agriculturally based economy and homes for an
expanding population?

11. In short, how much prime farmland must we
preserve to continue our present agriculture economy?

Norma Lowry
3719 Van Dusen
Riverbank, Ca. 95367

Yokuts Task Force on
Modesto City Wastewater Facility

June 30, 1979

Mr. Jones
Hearing Office
U. S. Environmental Protection Agency
215 Fremont Street
San Francisco, Ca 94105

Dear Mr. Jones:

We would like to bring to your attention the urgent need for NEPA to include the Hughson Wastewater in the present Modesto sewer plant expansion. Please note that the City of Hughson Wastewater EIR does not include the legal On Site and Adjacent to the Site physical descriptions of the environmental setting. An assessment of the Harris-Moldenhauer EIR is attached so that you may know the setting on and adjacent to the Tuolumne River site, 3b.

The implementation of 3b updating and expansion will continue to degrade the Tuolumne River's waters and our groundwater and cause financial ruination of many home-owners and vast and dire economic losses for many others adjacent to the proposed site. These conditions would most certainly go against the policy of NEPA's Act. P.L. 90-190. Following P.L. 92-500 would be to consolidate Hughson's small sewerage treatment plant, including industrial waste, with Modesto's Regional Plant for the "best practicable waste treatment technology," and stop the expansion of sewage ponds onto prime agriculture land and directly into urban cluster areas.

The Consolidation of the Hughson wastewater with Modesto, would not only stop the inundation of twenty acres of peach orchard now, the toe-hold start of more farmland into pondage in several years, but Consolidation would return forty acres back into farmland. This forty acres would partially off-set the one hundred acres of land to be added to the Modesto expansion.

We do not agree with Mr. John Hamill's response in the Modesto Bee that Consolidation would have to be arranged by Modesto and Hughson. It is our opinion that it is the responsibility of NEPA to enforce Public Law 92-500. Turlock and Modesto are both Regional Wastewater Treatment Plants. Let us give you an example of the need for NEPA's enforcement powers. From the Modesto Bee's May 11, 1978, article, "Turlock - The City Planning Commission is opposed to any agreement that would allow the City of Hughson to connect to the Turlock municipal wastewater treatment plant. In a resolution, commissioners declared that the city must hold in reserve any additional capacity presently available in the plant for future expansion." How then is any outlying town suppose to consolidate with a Federally Funded Regional Treatment Plant?

As Modesto is now considering the expansion of its wastewater plant and trunk line out Yosemite Avenue toward Hughson, we ask you to consider the inclusion of the City of Hughson wastewater.in the proposed Modesto planning.

A~~s for~~ the cost-effectiveness of consolidation with Modesto at the Beard Track's 48 inch trunk line or the Empire trunk line at Yosemite Avenue, you will find that the lineal footage from the Hughson pumping station almost exactly the same as the lineal footage from Winton to Atwater. With an increase to a sixteen inch line, this "best" alternative will cost Hughson approximately one million dollars. That's a long way from 2.6 million dollars cost estimate the engineer for the City of Hughson has proposed. With the enforcing of Public Law 92-500 we are sure this cost-effective alternative can be worked out for the betterment of the Hughson citizens and the citizens surrounding the Tuolumne River proposed site.

We ask your agency, NEPA, to consider the inclusion of the City of Hughson wastewater with the 1982-83 expansion of the Modesto wastewater system at this time.

Respectfully,

Francis L. Noeller

Francis Noeller
Petitioners' Representative
Rt. 2, 6454 Leedom
Hughson, Ca 95326

cc:
Mr. Caesar Hernandez EPA, Region IX
Mr. Paul DeFalco, Jr., NEPA
Mr. Douglas M. Castle, NEPA
Mr. Doyle Dodd, SAAG
Mr. Charles Willett, Chairman, Planning Comm.
Mr. Harter Bruch, Stan. Co. Planning
Ms. Norma Lowry, Sierra Club, Mother Lode
Mr. Harry Durham, Sierra Club, Yokuts Group
Mr. W. M. Stallard, State Water Resource CB
Mr. James Robertson, CRWQCB, Central Valley Region, Sac.
Mr. Charles Bell, Martin, Barker & Croskey
✓ Mr. Harold Bissell, Jones & Stokes Assn, Inc.
Congressman Norman D. Shumway
Assemblyman Carmen Perino
Assemblyman John E. Thurman
Mr. Stan R. Phillippe, CRWQCB
Mr. Roy V. Bernett, Farmers Home Administration

(HE-153) 13

U.S.E.P.A.
REGION 9
COMM CNTR

July 21, 1979 JUL 23 1 13 PM '79

Mr. Jones
Hearing Office
U. S. Environmental Protection Agency
215 Fremont Street
San Francisco, Ca 94105

Re: Consolidation of Hughson with Modesto Regional Treatment System.

Dear Mr. Jones:

In regards to the recent EPA meeting in Modesto about their sewer treatment update, the decisions that have been made have provided Hughson with the most feasible, cost-effective sewerage treatment alternative.

We feel that the State Water Resources Board and your office should give this alternatave considerable thought.

Basically, Modesto is considering deleting the East Empire, prime agricultural acreage from its Master Sewer Plan. In so doing it leaves Hughson with a good opportunity to tie in with the present Modesto Trunk line that runs to Empire.

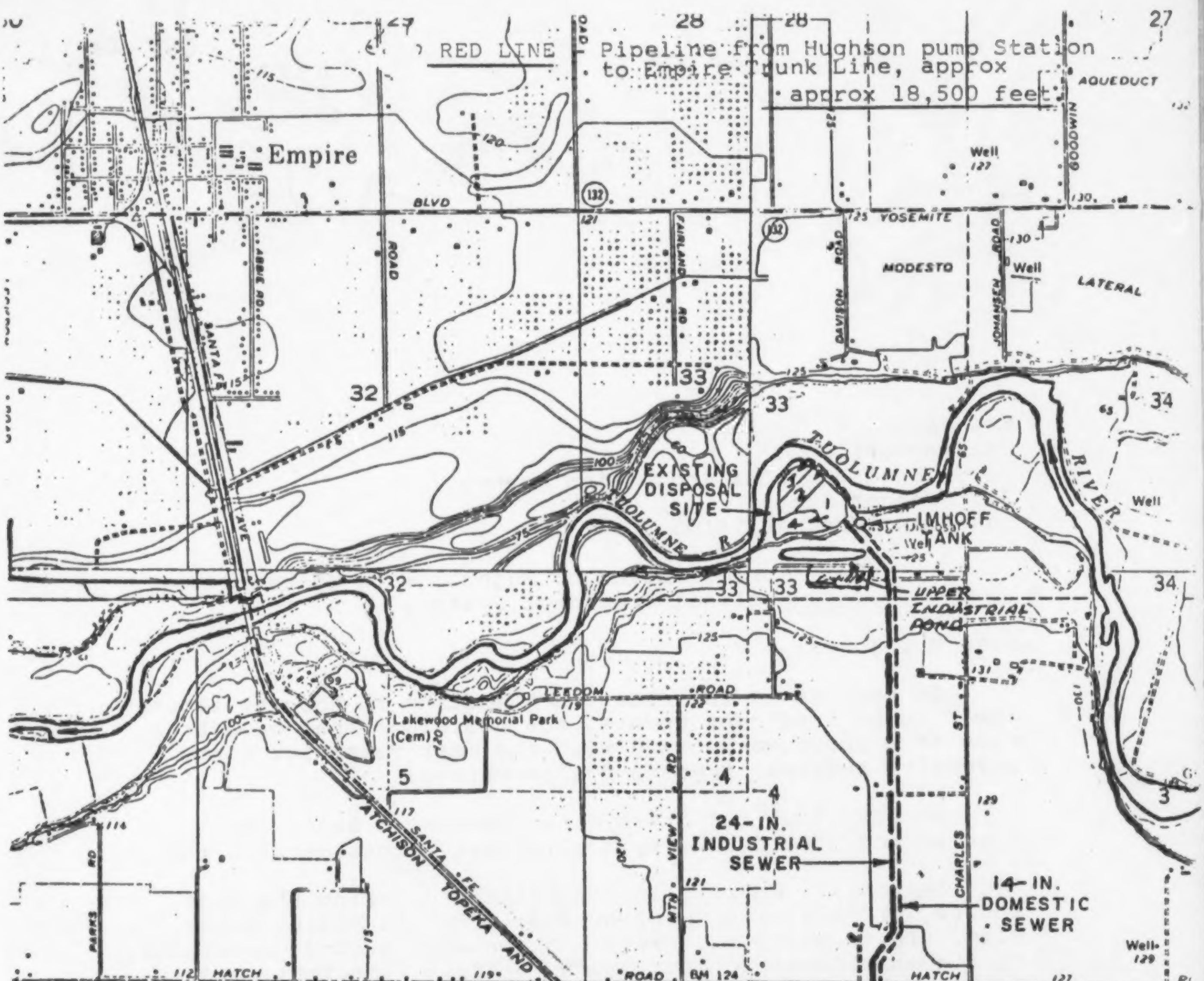
Thank you for your time and consideration.

Respectfully yours,

Francis Noeller

Francis Noeller
Homeowners' Representative
Rt. 2, 6454 Leedom
Hughson, California 95326

enc: 1
Map



RED LINE - Pipeline from Hughson pump Station to Empire Trunk Line, approx
approx 18,500 feet

Empire
Hughson
TUOLUMNE RIVER
TUOLUMNE R
EXISTING DISPOSAL SITE
IMHOFF TANK
UPPER INDUSTRIAL POND
24-IN. INDUSTRIAL SEWER
14-IN. DOMESTIC SEWER
DIVERSION PUMP
SEWAGE LIFT STATION
FOREMOST MILK PLANT
Lakewood Memorial Park (Cem)
ATCHISON TOPEKA AND SANTA FE
SANTA FE AVENUE
YOSEMITE BLVD
MODESTO LATERAL
AQUEDUCT
HATCH ROAD
MAIN CANAL
CERES
LEDOM ROAD
CHARLES ST
CLINTON ROAD
BALDWIN ROAD
PARKS RD
MTN VIEW RD
FAIRLAND RD
DAVISON ROAD
JOHANSEN ROAD
GOODWIN
SANTA FE AVE
ABBIE RD
STREET
FOX
Well
Well 109
Well 127
Well 129
Well 122
BM 124
Hatch Sch
Ross Sch
Union High Sch
132
27
28
32
33
34
3
4
5
8
9
10
SCALE: 1" = 2000'

CITY OF HUGHSON
STANISLAUS COUNTY

DENAIR AND WATERFORD, CALIF.
7.5' QUAD.
SCALE 1" = 2,000'

Response to Comments by Francis Noeller, Representing A Group of Hughson Area Residents. The City of Hughson is investigating the feasibility of consolidating its sewage system with Modesto's.

Exhibit 12
HE-153
27 June 79

EIS HEARING
MODESTO POTW ALTERNATIVE
6/27/79

CLC members; Tri Valley Growers, Del Monte, Tillie Lewis Foods, and Stanislaus Foods, being major contributors to the POTW, encourage and support the City of Modesto in its efforts to develop land disposal of waste water. Furthermore, we support this EIS and urge that a land disposal system be considered a cost effective and environmentally desirable alternative.

We understand the City's situation concerning the present sewerage status and have and will continue to make every effort to cooperate with the City in meeting effluent guidelines and plant handling capabilities. For example, canners have reduced flows, installed pretreatment for fixed solids, and will attempt to reduce BOD generation during the 1979 season.

We have felt the pinch of increased sewerage costs when some communities have failed to consider all possible alternatives. In some cases, municipal treatment costs became so prohibitive that companies pulled out of the POTW's. This is contrary to congressional intent as stated in the 1972 Clean Water Act Amendments and is obviously undesirable for the non-industrial user who is left with an increased revenue burden.

We believe that the City of Modesto has made every effort and will continue to achieve cost conserving measures in its Public Works Programs.

CLC members take exception to the statement on Page 15 of the EIS which says, "furthermore, food processing is forecast to become decreasingly important in Modesto's economy through the end of the century."

This statement may bear some truth in that as Modesto grows, a shift may occur in the industry base; however, we are not convinced that our importance is diminishing. In addition to large corporate expenditures in the community, each packing season the canners provide approximately 7,500 employment opportunities. Undoubtedly a major portion of these payrolls purchase many goods and services in Modesto.

We see a trend in the reduction of food processing facilities in the major urban areas due to unreasonable operating costs. It is not unlikely, considering the favorable business climate in Modesto, that food processors may relocate or shift production capabilities to Modesto.

For example, only three years ago Tillie Lewis Foods made a major shift in its production operations to Modesto. We do not believe this is undesirable, but feel that the City of Modesto has the occasion, based on the wastewater treatment alternative it chooses, to continue to offer opportunities to the business sector.

In conclusion, we again support the EIS and encourage the City of Modesto to pursue the land disposal alternative.

Response to Roger Ver Mulm, Canners League of California. (Mr. Ver Mulm's public hearing comments were the same as those in the letter from the Canners League of California). The point of the EIS was that the food processing industry - the major industry in Modesto - is not critically dependent on the amount of prime agricultural land in production in Stanislaus County, because the food inputs are produced generally within a 100-mile radius and in some cases as far south as Bakersfield or as far north as Lake County. Furthermore, because the industry does not appear to be expanding, it is unlikely that additional food inputs will be required from the area immediately around Modesto. Other industries are, however, expanding in the local area; consequently, the relative importance of canning - when measured in terms of jobs - is decreasing locally. These statements were not intended to deny the importance of the food processing industry to the Modesto economy.

Comments From Local Agencies

The City of Ceres was the only local government agency which submitted written comments on the Draft EIS. While the City of Modesto and the Stanislaus Area Association of Governments did not submit formal comments, comments were transmitted less formally through meetings, telephone calls, and informal memos. These comments were considered in preparing text revisions for the Final EIS.

(HE-153) 7

CITY of CERES
Phone 537-8911 - 2720 Second Street
CERES, CALIFORNIA 95307

CITY OF
CERES
2720 2nd STREET CERES. CA. 95307

CITY COUNCIL — TED HUMPHRIES, Mayor
BRIAN CARLIN SAL CANNELLA
JIM DELHART JOHN EBERLE

RECEIVED
REGION IX
JUN 11 11 15 AM '79

June 8, 1979

United States Environmental Protection Agency
ATTENTION: Hearing Office, HE - 153
Region IX
215 Fremont Street
San Francisco, California 94105

Dear Sirs:

The City of Ceres has reviewed the Draft Environmental Impact Statement on the Modesto Wastewater Facilities Improvements circulated by your office. The following are our comments.

Our primary comment concerns the designated current and ultimate sewer service areas for the City of Modesto as identified throughout the E.I.S. The Modesto Sewerage Survey prepared in 1966 by Brown and Caldwell consulting engineers for the City of Modesto and Stanislaus County indicated that the "South Trunk" (installed with federal funds) would ultimately service the area north of Hatch Road, south of the Tuolumne River, east of Herndon Avenue, west of Mitchell Road between the Cities of Modesto and Ceres. The City of Modesto is currently providing sewer service to a portion of this area. It is our feeling that this area must therefore be included within the designated current and ultimate sewer service areas.

> Page 4, Figure 1-1; "Prime and Non-Prime soils in the Modesto Area". The current and ultimate sewer service areas are incorrect for the reasons noted above.
>
> Page 12, Modesto Study Area. Do these figures include the South Trunk area? If not, they are incorrect.
>
> Page 71, Figure 4-1; "Comparison of Areas Discussed in the E.I.S.". Again, map is incorrect as it does not include "South Trunk Area".

Page 74, Land Use Conditions and Forecasts. Because of recent development, the figures which pertain to the City of Ceres may now be inaccurate. The Ceres Planning Department will attempt to provide updated figures for the final E.I.S.

Page 115, figure 5 - 5; "Prime and Non Prime Soils in Modesto Area". Map is incorrect as South Trunk Area is not fully included within service area.

Page 119, Fiscal Impacts of Agricultural Land Conversion. We question these assumptions because of property tax limitations set forth by Proposition 13. Updated information is needed.

Page 134, Mitigation Measure 5. "In Effect?" Parenthetical Statement indicates that the "No Man's Land" (portion of South Trunk area) area will be served by the City of Modesto. This should be reflected on maps throughout this document. We further feel that this fact should be brought out within the verbal descriptions of the sewer service areas.

Thank you very much for the opportunity to comment.

Sincerely,

Joe Hollstein

JOE HOLLSTEIN, Director of Public Works, City Engineer

ROBERT E. SMITH, Assistant Planner

J.H.:RES:ls

SL

AUG 15

CITY OF CERES VACANT RESIDENTIAL LAND SURVEY

April, 1979

Prepared by the City of Ceres Planning Department.

Introduction

The following is a survey prepared by the City of Ceres Planning Department to quantify various types of residentially zoned vacant land within the Ceres City Limits as of April, 1979. Because it is very difficult and many times misleading to simply label land as "vacant" or "undeveloped" without further qualification, various types of vacant lands have been identified.

"Approved Tentative Subdivision Maps" means subdivisions which have been approved by the Ceres Planning Commission at the Tentative or Preliminary stage. Because final maps have not been recorded, these lots do not actually exist. These maps could be completed and fully developed, or expire.

"Approved Final Subdivisions Now Under Construction" means subdivisions which have been created and are under various stages of construction. Under this heading, a "lot under construction" means a lot for which a building permit has been issued.

"Total Vacant Lots" is simply the summation of the number of currently approved tentative lots and the number of final lots for which no building permit has been issued.

"Remaining Vacant Land" is undeveloped residentially zoned land for which no tentative or final subdivision map has been approved. It should be noted that a significant portion of the residentially designated land under a Planned Community Zoning Classification may be redesignated to other than residential by future amendments to the Ceres General Plan.

A. Total City Area

2,282.33 Acres or 3.57 Square Miles.

B. Approved Tentative Subdivision Maps Within the City.

	Subdivision Name	Number of Lots	
1.	Valley Estates	52	
2.	Lu Ran Estates Unit No. 2	37	
3.	The Parks Unit No. 2	48	
4.	Richards Manor	43	
5.	Taylor Manor	43	
6.	Don Pedro Estates	26	(+1 drainage lot)
7.	Whitmore Gardens Unit No. 2	7	
8.	Patio Gardens	62	
9.	Walnut Woods	26	
10.	Nineveh Estates Unit No. 2	40	
	TOTAL	384	

C. Approved Final Subdivisions Now Under Construction

	Subdivision Name	Total No. of Lots		Lots Under Construction or Completed	Remaining Vacant Lots
1.	Nineveh Estates Unit No. 1	47		17	30
2.	Fruitridge Gardens	41		0	41
3.	Northridge Heights	63		0	63
4.	La Rosa Estates	181	(+2 for Park)	53	128
5.	Lynley Manor Unit No. 2	93	(+1 for Park)	19	74
6.	Northridge	102		0	102
7.	Vintage Park	123	(+1 for detention basin)	20	103
8.	Roeding Heights Unit No. 1	56		54	2
9.	Roeding Heights Unit No. 2	42		2	40
10.	San Ramon Unit No. 2	63		20	43
11.	Peachwood Estates	222		202	20
12.	Ceres Square	24		0	24
13.	Rosewood Tract	143		22	121
	TOTALS	1,242		451	791

D. Total Vacant Lots Within City Limits

1.	Approved "Tentative" Lots	384
2.	Available "Final" Lots	791
	TOTAL	1,175

E. Remaining Vacant Residentially Zoned Land Within City Limits By Zoning District.

1. R-A, Residential Agriculture - about 12 Acres.
2. R-1, Single Family Residential - about 71 Acres.
3. R-2, Two Family Residential - about 7 Acres.
4. R-3, Medium Density Multiple Family Residential - about 33 Acres.
5. R-4, Medium-High Density Multiple Family Residential - about 21 Acres.
6. P-C, Planned Community (Residentially designated on General Plan) - about 81 acres.

TOTAL - 225 Acres.

Response to Comments By the City of Ceres. The current and ultimate sewer service areas mapped in the EIS include only the area within the Modesto sewer district. There are several areas to which Modesto either currently provides or will in future provide sewage treatment capacity - e.g., the area described by Ceres ("No Man's Land") and the community of Empire - that are not within the district and are therefore not included in the mapped sewer service areas.

The exclusion of these areas does not reflect on Modesto's intention to provide wastewater treatment capacity to those areas. Modesto staff have indicated that the city has agreed to provide treatment capacity for the No Man's Land area, but that extensions of the South Trunk beyond its existing terminus at Herndon Road are the responsibility of the City of Ceres.

Neither does the exclusion of these lands from the mapped sewer service areas affect the EIS analysis of socio-economic impacts. Economic, population and housing growth are forecast for the entire socio-economic study area in Appendices A and B; a portion of the forecast growth is allocated to Modesto in Chapter 5, with no implications for the amount of growth anticipated in Ceres or the remainder of the study area.

The land use information provided by the City of Ceres updates the land use information in the EIS (e.g., Appendix B, Table B-3, page B-6), but does not affect the land use analysis presented because the EIS does not allocate any land uses specifically to the City of Ceres. In addition, the new data cannot be integrated into the EIS tables because they are not broken down into comparable land use categories.

With the passage of Proposition 13 in June 1978, the amount of property tax revenue forthcoming from all types of urban and rural lands significantly decreased, creating or widening a gap between the cost of public services and the revenues to cover them generated by various land uses. No studies quantifying the comparative effects of Proposition 13 on various land uses' property tax contributions have as yet been published. Nevertheless, the main point of the discussion of fiscal impacts presented in Chapter 5 (page 117) remains valid: that many of the apparently disparate fiscal effects of different land uses disappear when the fiscal analysis is expanded to include not only direct but also indirect costs and revenues, and that the net impact on local governments when both direct and indirect factors are considered results in large part from the structure of local government finance rather than the land use characteristics themselves.

Comments From State Agencies

STATE OF CALIFORNIA
EDMUND G. BROWN JR., Governor

AIR RESOURCES BOARD
1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812
(916) 322-5350

'D BY E.P.A
REGION IX
MM. CENTER
MAY 4 [illegible] 4 AM '79

May 2, 1979

Mr. Allan Abramson
Chief, California Branch
Environmental Protection Agency
215 Fremont Street
San Francisco, CA 94105

Dear Mr. Abramson:

SUBJECT: Draft Environmental Impact Statement (DEIS), Modesto Wastewater Facilities Improvements

We have reviewed the DEIS for the Modesto Wastewater Facilities Improvements and find it presents adequately the air quality impacts of the proposed project. This project will increase treatment plant capacity in a range from 15 to 18.7 million gallons per day which, in turn, will accommodate between 58,400 and 84,700 new residents in the project service area. The DEIS states, on page 16, the following:

> "Development accommodated by the proposed project will contribute the following amounts of reactive organic emissions during the smog season; 1.52 tons/day in 1985; 2.19 tons/day in 1990; and 3.06 tons/day in 1995."

The DEIS identifies possible mitigation measures which could be implemented to mitigate some of the above air quality impacts.

The Air Resources Board (ARB), following a March 22, 1979 public hearing, adopted a revision to the State Implementation Plan for Stanislaus County which demonstrates attainment and maintenance of the national ambient air quality standards for carbon monoxide and ozone prior to 1984. We will be submitting this revision to EPA soon. It appears the statements in the DEIS regarding the nonattainment plan (NAP) emissions reduction shortfall should be revised to be consistent with the SIP revision.

In adopting the Stanislaus SIP revision, the ARB directed the Executive Officer, "... to work in cooperation with appropriate agencies to develop mechanisms consistent with Sections 176(c) and 316(b) of the Clean Air Act for determining that federally assisted projects ... which result in increases in emissions are consistent with reasonable further progress toward attainment and maintenance of NAAQS ... The Board further finds that future federally funded projects which enable population growth beyond that projected to occur in the Stanislaus Plan should be required to provide for additional mitigation measures, if necessary, to maintain RFP and/or the NAAQS depending upon the condition at the time."

The total increases in population related to the construction of this wastewater treatment work appears consistent with the population projection on which the NAP is based, but there is no mechanism to ensure that the rate of population increase will be consistent with the rate of population and related emissions increase that was used in the development of the NAP. We are currently working with the SWRCB to develop the following mechanism and suggest that EPA include it in the approval of the Modesto wastewater facility:

> Include in the Clean Water Grant for the Modesto Wastewater Facility Improvements a condition correlating the rate of increase in plant capacity to the population projection in the NAP and that further, a similar condition be placed in the NPDES permit for the plant.

With the inclusion of such conditions in the grant and in the NPDES permit, we believe that the mitigation requirements proposed in your April 6, 1979 letter to Mr. Ross Campbell of Modesto are unnecessary insofar as they are needed to achieve reasonable further progress (RFP) toward the attainment and maintenance of NAAQS.

In addition, since the DEIS does expressly quantify the emissions attributable to the proposed project, it is recommended that these quantified emissions be incorporated into the SIP for

Stanislaus County to aid in meeting requirements of Section 316 of the Clean Air Act. We will be working with Stanislaus in making an appropriate revision to the SIP.

Sincerely,

W. C. Lockett

William C. Lockett, Chief
Planning Division

cc: R. Campbell, Modesto
H. Bissell, Jones & Stokes
J. Wise, EPA
J. Hamill, EPA
K. Easterwood, OPR
N. Dunham, SWRCB
J. Cook, SWRCB

Response to Comments By the Air Resources Board. The revised analyses of project capacity and growth accommodation (Chapters 3 and 4) should be noted. Chapter 6 has been revised to reflect the March 22, 1979 Air Resources Board actions regarding the SAAG nonattainment plan.

(HE-153) 2

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY
EDMUND G. BROWN JR., Governor

DEPARTMENT OF HEALTH SERVICES
2151 BERKELEY WAY
BERKELEY, CA 94704
(415) 540-2154

U.S.E.P.A.
REGION 9
COMM CNTR
MAY 23 11 11 AM '79

May 22, 1979

U.S. Environmental Protection Agency
Attn: Hearing Office, HE-153
Region IX
215 Fremont Street
San Francisco, CA 94105

DRAFT EIS ON MODESTO WASTEWATER FACILITIES IMPROVEMENTS

The State of California Department of Health Services has reviewed the draft Environmental Impact Statement on the Modesto Wastewater Facilities Improvements and requests that this memorandum be included in the record of the public hearing to be held on June 27, 1979.

The Department has reclamation regulations entitled "Wastewater Reclamation Criteria" (California Administrative Code, Title 22, Division 4) that include wastewater quality and treatment reliability provisions for the types of reuse proposed in the draft EIS. These Wastewater Reclamation Criteria are applicable to wastewater discharged to irrigation canals, and, where there are multiple types of reuse, the Department of Health Services recommendations would be based on the greatest expected degree of contact with the reclaimed water. Consequently, any effluent from the City of Modesto's wastewater treatment facilities discharged to the irrigation canal serving the West Stanislaus Irrigation District should comply with Section 60305 of the Wastewater Reclamation Criteria if all unprocessed food crops are surface irrigated with water from the canal or Section 60303 if any unprocessed food crops are spray irrigated with water from the canal.

Dilution of effluent that is not pathogen-free merely reduces the concentration of viruses or other pathogens that may be present but does not eliminate them. The attendant health risks, albeit somewhat reduced, are not substantially different from those resulting from the use of undiluted effluent. Therefore, the Department of Health Services does not consider dilution of reclaimed water with other water to be an acceptable alternative to treatment processes specified in the wastewater reclamation regulations. Further, the means for compliance with all other applicable sections of the Wastewater Reclamation Criteria, e.g., sampling and analysis and treatment reliability, should be described in the final EIS.

John M. Gaston

John M. Gaston, Chief
Sanitary Engineering Section

Response to Comments By the Department of Health Services. Table 9-1 of the EIS identifies treatment and disinfection requirements of the state wastewater reclamation criteria. The City of Modesto has not yet completed negotiations with potential irrigators. In the absence of formal selection of reuse areas, final details on effluent disinfection procedures, sampling and analysis procedures, and system reliability cannot yet be presented. The City of Modesto and the project engineers will present such information to the Department of Health Services prior to receipt of any reclamation permits.

STATE OF CALIFORNIA—RESOURCES AGENCY
EDMUND G. BROWN JR., Governor

DEPARTMENT OF WATER RESOURCES
THE RECLAMATION BOARD
1416 – 9th Street, Room 335-18
Sacramento, CA 95814
(916) 445-9454

RECD BY E.P.A.
REGION IX
COMM CENTER
MAY 8 [illegible] 15 AM '79

MAY 4 - 1979

Mr. Paul De Falco, Jr., Regional Administrator
U. S. Environmental Protection Agency
Region IX
215 Fremont Street
San Francisco, CA 94105

Dear Mr. De Falco:

We have reviewed the Draft Environmental Impact Statement (DEIS) for Modesto Wastewater Facilities Improvements and have the following comments. The remote oxidation ponds are adjacent to a portion of the right bank San Joaquin River Flood Control Project levees. The portion of the ponds adjacent to the project levee is under Reclamation Board Application No. 5560 approved on June 16, 1967.

The primary wastewater treatment plant along the Tuolumne River has the portion of its facilities (ponds) immediately adjacent to the river under Reclamation Board application (No. 8335, approved July 28, 1972).

We note from the DEIS that there may be some modification of the remote ponds. Any modification of the remote ponds or of the primary treatment plant facilities may affect either the San Joaquin River Flood Control Project levee or the Tuolumne River floodway. Reclamation Board approval is required prior to construction or modification of any facilities adjacent to the San Joaquin or Tuolumne Rivers.

The local agency, the City of Modesto, should contact Ted Allen, Reclamation Board Permits Section, Room 335-10, 1416 Ninth Street, Sacramento, CA 95814; telephone (916) 445-9225 for applications and information.

We believe the DEIS adequately discusses the impacts of the proposed project. Thank you for furnishing this document for our review.

Sincerely,

Eldon E. Rinehart
ELDON E. RINEHART
General Manager

save water

Response to Comments By the Reclamation Board. Figures 11-1 through 11-4 illustrate the storage pond alternatives under consideration. The levees along the San Joaquin River will not be affected by the new storage pond. Effluent distribution pipelines will, however, cross either the San Joaquin River or the Tuolumne River, depending on choice of reuse areas. Such stream crossings will require permits from the California Reclamation Board, California Department of Fish and Game, and the U. S. Army Corps of Engineers.

(HE-153)15

OFFICE OF THE SECRETARY
RESOURCES BUILDING
1416 NINTH STREET
95814

(916) 445-5656

Department of Conservation
Department of Fish and Game
Department of Forestry
Department of Navigation and
Ocean Development
Department of Parks and Recreation
Department of Water Resources

EDMUND G. BROWN JR.
GOVERNOR OF
CALIFORNIA

Air Resources Board
California Coastal Commission
California Conservation Corps
Colorado River Board
Energy Resources Conservation and
Development Commission
Regional Water Quality Control Boards
San Francisco Bay Conservation and
Development Commission
Solid Waste Management Board
State Coastal Conservancy
State Lands Commission
State Reclamation Board
State Water Resources Control Board

THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

1979 JUL 31

Mr. Paul DeFalco, Jr.
Regional Administrator
Environmental Protection Agency
215 Fremont Street
San Francisco, CA 94105

Dear Mr. DeFalco:

The State of California has reviewed the draft environmental impact statement, "Modesto Wastewater Facilities Improvements", submitted through the Office of Planning and Research in the Governor's Office.

This review, in accordance with Part II of Office of Management and Budget Circular A-95 and the National Environmental Policy Act of 1969, was coordinated with the Departments of Conservation, Fish and Game, Parks and Recreation, Water Resources, Food and Agriculture, and Health Services; the Air Resources, Solid Waste Management, and State Water Resources Control Boards; and the State Lands Commission.

The State strongly supports the policy of reducing the discharge of wastewater into the San Joaquin River and using the treated effluent for irrigation. Such a policy improves water quality and is an effective conservation measure.

Your report contains a great deal of information on the two most significant project-induced problems -- growth and the urbanization of prime agricultural lands. The report, however, is deficient in addressing these problems. More than 11,000 acres of prime agricultural land would be destroyed as a result of the project, yet no alternative describing a project with different study area boundaries is examined. This is unacceptable, since it violates the State's policies as discussed in the 1978 Environmental Goals and Policy Report, "An Urban Strategy for California". A brief discussion of the relevant sections of the Urban Strategy report is included below for your information.

The Clean Water Grant Priorities section of the Urban Strategy report (item 26, page 20) states that the State Water Resources Control Board is required to take "appropriate actions to assure that when Clean Water Grants are used to fund treatment facilities serving new urban and suburban development, that development shall be consistent with California's urban development priorities." The Urban Strategy report lists the priorities for locating new urban development (page 10).

In part, the report states that "Noncontiguous development would be appropriate when needed to accommodate planned open space, greenbelts, agricultural preservation, or new town community development."

After stressing the State's support for preserving agricultural lands from premature or needless conversion to urban uses, the Urban Strategy report states (item 20, page 18) that "Guided by State policies and subject to State review, cities and counties should take the lead in identifying lands to be preserved and assuring their protection."

It is clear from the above discussion that the State of California has given the highest priority to preserving agricultural lands that support an industry of national significance. The Urban Strategy report contains language supporting noncontiguous urban development in order to preserve agricultural lands or to create a new town. Given the above, the State urges the applicant to reconsider the full range of possible alternative actions that would accomplish the beneficial water quality and water conservation measures without destroying highly productive agricultural lands. The feasibility of creating a development at urban population densities outside the existing prime agricultural lands should be seriously considered.

The State has received the following specific comments from the Department of Conservation.

Chapter 5, C.

This section does not consider present planning and zoning laws which mandate a conservation and open space element of the general plan to preserve resources, including prime agricultural land, and require zoning to be consistent with these elements. This section should discuss the shortcomings of present law and what measures could be used to assure adequate protection. A complete discussion of present law is needed, including the mandatory conservation element, establishment of viable agricultural preserves, and local policies affecting the California Land Conservation Act (Williamson Act).

Chapter 5, F.

This section does not point out the contractual restrictions and effectiveness of the Williamson Act. More than 16 million acres, more than one-third of all privately owned prime and non-prime agricultural lands in the State, are under Williamson contracts which allow only agricultural or open space uses. In Stanislaus County, there are 669,798 acres under contract (48,801 acres are urban prime agricultural land within three miles of the Modesto city limits, 212,633 acres are other prime agricultural lands, and 407,364 acres are non-prime agricultural lands or open space). More than 62 percent of the total prime agricultural lands available within the County is under Williamson Act contracts.

Attached is a summary of the Williamson Act, including the 1978-79 Open Space Subvention Entitlements and a copy of a map showing the Williamson Act lands under contract within Stanislaus County. The Department of Conservation suggests that this information and Government Code sections commencing with 21500 and 6500 be reviewed and the report revised accordingly.

We appreciate having been given an opportunity to review this report.

Sincerely,

James W Burns

JAMES W. BURNS
Assistant Secretary for Resources

Attachment

cc: Office of Planning and Research
Director of Management Systems
1400 Tenth Street
Sacramento, CA 95814
(SCH 79060601)

SUMMARY OF

AUGUST 1978

THE WILLIAMSON ACT AND OPEN SPACE SUBVENTIONS

WILLIAMSON ACT

Preservation of agricultural and open space lands has been a problem of statewide significance in California. Many thousands of acres of irreplaceable agricultural and open space lands have been converted into mushrooming urban and industrial developments in recent years. To provide a means for the preservation of these lands, the State Legislature passed the California Land Conservation Act of 1965, commonly referred to as the Williamson Act.

The Williamson Act was adopted primarily as a means of keeping prime agricultural land in agriculture by the utilization of tax incentives to landowners. It was strongly supported by owners of large tracts of land and was generally supported by farmers, environmental groups, and others interested in preserving open space and agriculture lands by reducing pressures upon landowners to convert their land to urban and industrial development. It was originally opposed by city and county government because Williamson Act contracts reduce the property tax base which supports local government operations.

Initially, the Act included only prime agricultural land and there was no guarantee that the owner of the land under contract or agreement would receive a reduction in property taxes because of a constitutional requirement that all lands be assessed at market value. The presumption was that a restriction on the use of land limiting it solely to agricultural use would lower its market value and thereby lower the property tax. Assessors could not be required by statute to assume that the restrictions had any effect on market value. Thus, initially, Williamson Act contract restrictions had little effect on assessed values and the property tax bill of landowners.

In 1966, one year after passage of the Williamson Act, California's voters approved Proposition Three adding Article XXVIII to the State Constitution (later replaced by Section 8 of Article XIII). This Article granted the Legislature the authority to depart from market value assessment of enforceably restricted open space lands. In 1967, Sections 423 and 423.5 were added to the Revenue and Taxation Code to prohibit the State Board of Equalization and local assessors from using comparable sales data in valuing open space lands subject to enforceable restrictions and to assess these lands on the basis of capitalized income. This change in assessment practices led to a rapid increase in participation in the Act. Acceptance of the Act by local government and landowners had been minimal during the two years following its passage in 1965 and only 200,000 acres in six counties were placed under contract during that period. By March 1, 1968, 23 counties were participating with over 2 million acres of land under Williamson Act enforceable restrictions.

Participation in the Act is voluntary on the part of both local government and the landowner. The Act enables an owner of agricultural land to enter into a contract with local government to permit his land to be taxed as agricultural land in return for foregoing development of that land for a minimum period of 10 years. Thereafter, contracts are automatically renewed annually. Contracts can be canceled by the landowner only upon approval of local government and a finding that the cancellation is consistent with the purpose of the Williamson Act and is in the public interest. Payment of a cancellation fee of 50 percent of the assessed valuation of the land (equivalent to 12½ percent of the market value) is required.

The Act requires that cancellation fees be collected by local government and submitted to the State Controller for deposit in the State's General Fund. Cancellation fees can be wholly or partially waived by local government only with the approval of the Secretary for Resources, and only if the cancellation is in the public interest. Contracts may also be removed by filing a notice of nonrenewal The contract remains in effect for a period of 10 years after the notice is filed.

Open Space Subventions

In 1971, the State Legislature approved the Open Space Subvention Program. The stated purpose of the program is to provide replacement revenues to local government by reason of the reduction of the property tax on open space lands assessed under Section 423 and 423.5 of the Revenue and Taxation Code. Open space lands include agricultural lands, forest lands and "nonprime" lands such as grazing lands, wildlife habitats, wetlands, saltponds, scenic highway corridors, submerged lands and recreational areas. As of 10-31-77, 47 of the 58 counties within the State and 17 cities are participating in the Williamson Act and open space subvention program, with a total of about 15.6 million acres of land under enforceable restrictions. Of this total 3 percent is prime agricultural land in or near cities with 15,000 or more population, 27 percent is prime agricultural land in other areas, and 70 percent is forest land and nonprime open space land. About 50 million of the approximately 100 million acres of land within the State is privately-owned, and about 5 million acres are already urbanized. Thus, about 33 percent of the remaining 45 million acres of privately-owned land is under voluntary Williamson Act restrictions.

A particularly important aspect of the Williamson Act and related open space legislation, from the standpoint of land use planning, is a requirement that cities and counties prepare Open Space Plans and submit them for review to the Secretary for Resources. Local governments are required to adopt an open space action program and zoning ordinances consistent with their Open Space Plan.

To be eligible for subvention payment, a city or county must have an acceptable adopted open space element of its general plan on file with the Secretary for Resources. For local government to receive subvention payments on nonprime lands, those lands must be of statewide significance and designated for open space use in the open space element of the general plan. Furthermore, these lands must be devoted to open space under an enforceable restriction and assessed under Sections 423 or 423.5 of the Revenue and Taxation Code.

Local government open space subvention entitlements for the periods through the 1976-77 fiscal year were determined by the lesser of the estimated tax loss or a payment schedule based on the acreages and types of open space land. Through the 1976-77 fiscal year, the annual acreage payment schedule was $3.00 per acre for prime agricultural land within an expanded urban boundary, $1.50 per acre for other prime agricultural land, and $0.50 per acre for nonprime open space lands of statewide significance. The entitlement schedule was revised during the 1976 calendar year with the passage of AB 2222. This amendment to the program eliminated the estimated tax loss provision and revised the payment schedule based on acreages to $8.00 per acre for prime agricultural land within the expanded urban limits of incorporated cities with 25,000 or more population,

$5.00 per acre for prime agricultural land within the expanded urban limits of an incorporated city with 15,000 or more, but less than 25,000 population, $1.00 per acre for all other prime agricultural land, and $0.40 per acre for all nonprime land devoted to open space use of statewide significance.

School districts' open space subvention apportionments were determined by a more complex method than that for local government. Basically, the entitlements were determined by the lesser of the estimated tax loss or a complex payment schedule based on acreages and types of school districts.

If entitlement claims by local government and school districts exceed the funds budgeted for subvention payments in any particular year, reductions in payments to local government were made on a pro rata per acre basis, first, on other prime and nonprime open space lands, second, on urban prime agricultural lands, and last, to school districts.

Applications by local governments for subvention payments must be submitted to the Secretary for Resources on or before October 31 of each year in accordance with Resources Agency regulations. After the application is reviewed and eligibility and entitlement determined, the Secretary certifies the entitlement amount to the State Controller for payment. In the case of school districts, the Superintendent of Public Instruction received the applications and certified the entitlements. Payments are made by the Controller on or about June 25 of each year.

Proposition 13, passed by the voters in June, 1978, will reduce taxes on both contracted and noncontracted landowners by approximately 50 percent to 60 percent. It is possible that Proposition 13 could result in a reduction in the additional enrollment of land under the Williamson Act and could trigger some nonrenewals on existing contracts. After the passage of Proposition 13, it was determined that school districts were no longer eligible to receive open space subventions.

Administration of the Open Space Subvention Program has been assigned by the Secretary for Resources to the Department of Conservation. Information on subventions to local government can be obtained by contacting the State of California, Department of Conservation, Land Resource Protection Unit, 1416 Ninth Street, Room 1354, Sacramento 95814, telephone (916) 445-8733. Information on subvention payments to school districts can be obtained by contacting the State of California, Department of Education, Division of Administrative Services, Bureau of School Apportionments and Reports, 721 Capitol Mall, Sacramento, 95814, telephone (916) 445-4766.

Attached is a summary of lands placed under enforceable restriction and a list of the latest local government entitlements. Note: School apportionments are not included.

Resources Agency
Department of Conservation
Open Space Subvention Entitlements
1978–79 Fiscal Year

County	Urban Prime Land				Other Prime Land		Nonprime Land				
	Acres	Entitlement $8.00 per Acre	Acres	Entitlement $5.00 per Acre	Acres	Entitlement $1.00 per Acre	Acres	Entitlement $0.40 per Acre	Total Acreage Under Contract	Acreage Entitlement	Allowable Entitleme
neda	6,114.00	48,912.00	-0-	-0-	2,231.00	2,231.00	162,331.00	64,940.40	170,696.00	116,083.40	116,083
dor	-0-	-0-	-0-	-0-	2,526.00	2,526.00	92,710.00	37,084.00	95,236.00	39,610.00	39,610
e	16,484.00	131,872.00	-0-	-0-	38,350.00	38,350.00	126,202.00	50,480.80	181,036.00	220,702.80	220,702
veras	-0-	-0-	-0-	-0-	1,167.00	1,167.00	133,473.00	53,389.20	134,640.00	54,556.20	54,556
sa	-0-	-0-	-0-	-0-	-0-	-0-	198,169.00	79,267.60	198,169.00	79,267.60	79,267
tra Costa	868.00	6,944.00	-0-	-0-	8,610.00	8,610.00	78,913.00	31,565.20	88,391.00	47,119.20	47,119
Dorado	-0-	-0-	-0-	-0-	2,229.00	2,229.00	184,736.00	73,894.40	186,965.00	76,123.40	76,123
no	29,227.00	233,816.00	-0-	-0-	989,139.00	989,139.00	451,738.00	180,695.20	1,470,104.00	1,403,650.20	1,403,650
n	-0-	-0-	-0-	-0-	51,126.00	51,126.00	240,027.00	96,010.80	291,153.00	147,136.80	147,136
boldt	-0-	-0-	-0-	-0-	-0-	-0-	169,807.00	67,922.80	169,807.00	67,922.80	67,922
l	23,427.00	187,416.00	-0-	-0-	852,138.00	852,138.00	828,757.00	331,502.80	1,704,322.00	1,371,056.80	1,371,056
gs	-0-	-0-	48,666.00	243,330.00	452,541.00	452,541.00	123,181.00	49,272.40	624,388.00	745,143.40	745,143
e	-0-	-0-	-0-	-0-	5,223.00	5,223.00	43,774.00	17,509.60	48,997.00	22,732.60	22,732
en	-0-	-0-	-0-	-0-	12,033.00	12,033.00	113,561.00	45,424.40	125,594.00	57,457.40	57,457
Angeles	-0-	-0-	-0-	-0-	-0-	-0-	40,032.00	16,020.80	40,032.00	16,020.80	16,020
lera	-0-	-0-	26,449.00	132,245.00	165,725.00	165,725.00	304,349.00	121,739.60	496,523.00	419,709.60	419,709
in	1,399.00	11,192.00	-0-	-0-	8,709.00	8,709.00	81,440.00	32,576.00	91,548.00	52,477.00	52,477
iposa	-0-	-0-	-0-	-0-	-0-	-0-	131,965.00	52,786.00	131,965.00	52,786.00	52,786
docino	-0-	-0-	-0-	-0-	19,963.00	19,963.00	1,146,771.00	458,708.40	1,166,734.00	478,671.40	478,671
terey	2,298.00	18,384.00	-0-	-0-	54,688.00	54,688.00	572,864.00	229,145.60	629,850.00	302,217.60	302,217
a	3,048.00	24,384.00	-0-	-0-	7,566.00	7,566.00	62,593.00	25,037.20	73,207.00	56,987.20	56,987
ada	-0-	-0-	-0-	-0-	-0-	-0-	5,803.00	2,321.20	5,803.00	2,321.20	2,321
nge	4,510.00	36,080.00	-0-	-0-	967.00	967.00	58,317.00	23,326.80	63,794.00	60,373.80	60,373
er	-0-	-0-	1,596.00	7,980.00	17,475.00	17,475.00	63,372.00	25,348.80	82,443.00	50,803.80	50,803
nas	-0-	-0-	-0-	-0-	-0-	-0-	109,074.00	43,629.60	109,074.00	43,629.60	43,629
rside	9,740.00	77,920.00	-0-	-0-	53,524.00	53,524.00	33,609.00	13,443.60	96,873.00	144,887.60	144,887
amento	8,928.00	71,424.00	-0-	-0-	99,485.00	99,485.00	134,925.00	53,970.00	243,338.00	224,879.00	224,879
Benito	-0-	-0-	-0-	-0-	55,905.00	55,905.00	508,094.00	203,237.60	563,999.00	259,142.60	273,147
Bernardino	11,160.00	89,280.00	-0-	-0-	1,533.00	1,533.00	9,114.00	3,645.60	21,807.00	94,458.60	94,458
Diego	3,547.00	28,376.00	-0-	-0-	17,260.00	17,260.00	114,872.00	45,948.80	135,679.00	91,584.80	91,584
Joaquin	55,916.00	447,328.00	-0-	-0-	314,593.00	314,593.00	155,684.00	62,273.60	526,193.00	824,194.60	824,194
Luis Obispo	7,154.00	57,232.00	-0-	-0-	67,935.00	67,935.00	620,506.00	248,202.40	695,615.00	373,369.40	373,369
Mateo	658.00	5,264.00	-0-	-0-	1,021.00	1,021.00	46,165.00	18,466.00	47,844.00	24,751.00	24,751
a Barbara	23,133.00	185,064.00	-0-	-0-	43,049.00	43,049.00	456,072.00	182,428.80	522,254.00	410,541.80	410,541
a Clara	5,284.00	42,272.00	-0-	-0-	16,359.00	16,359.00	359,472.00	143,788.80	381,115.00	202,419.80	202,419
a Cruz	-0-	-0-	1,208.00	6,040.00	1,447.00	1,447.00	15,204.00	6,081.60	17,859.00	13,568.60	13,568
sta	457.00	3,656.00	-0-	-0-	11,395.00	11,395.00	136,358.00	54,543.20	148,210.00	69,594.20	69,594
ra	-0-	-0-	-0-	-0-	-0-	-0-	46,518.00	18,607.20	46,518.00	18,607.20	18,607
iyou	-0-	-0-	-0-	-0-	42,244.00	42,244.00	320,332.00	128,132.80	362,576.00	170,376.80	170,376
no	34,193.00	273,544.00	-0-	-0-	90,457.00	90,457.00	158,909.00	63,563.60	283,559.00	427,564.60	427,564
oma	4,935.00	39,640.00	-0-	-0-	24,091.00	24,091.00	248,814.00	99,525.60	277,840.00	163,256.60	163,256
islaus	49,801.00	398,408.00	-0-	-0-	212,633.00	212,633.00	407,364.00	162,945.60	669,798.00	773,986.60	773,986
ama	-0-	-0-	-0-	-0-	41,654.00	41,654.00	714,626.00	285,850.40	756,280.00	327,504.40	327,504
ity	-0-	-0-	-0-	-0-	832.00	832.00	9,796.00	3,918.40	10,628.00	4,750.40	4,750
re	47,410.00	379,280.00	-0-	-0-	473,179.00	473,179.00	550,928.00	220,371.20	1,071,517.00	1,072,830.20	1,072,830
umne	-0-	-0-	-0-	-0-	-0-	-0-	206,231.00	82,492.40	206,231.00	82,492.40	82,492
tura	30,984.00	247,872.00	-0-	-0-	21,397.00	21,397.00	110,972.00	44,388.80	163,353.00	313,657.80	313,657
	58,018.00	464,144.00	-0-	-0-	200,011.00	200,011.00	193,948.00	77,579.20	451,977.00	741,734.20	741,734
Counties	438,713.00	3,509,701.00	77,919.00	389,593.00	4,482,430.00	4,482,430.00	11,082,512.00	4,433,004.80	16,091,574.00	12,814,733.80	12,828,738
ties	7,563.00	60,504.00	239.00	1,195.00	662.00	662.00	36,460.00	14,584.00	44,924.00	76,943.00	76,943
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

DEPARTMENT OF CONSERVATION
"Summary of Open Space Subvention Program"

August 1978

Acreage Under Williamson Act Contracts and Open Space Subvention Program

Acreage (in millions of acres)

Fiscal Year	Urban Prime	Other Prime	Nonprime	Total
1972-73	0.709	2.719	8.012	11.440
1973-74	0.801	3.114	8.804	12.719
1974-75	0.852	3.287	9.602	13.741
1975-76	0.907	3.464	10.056	14.427
1976-77	0.984	3.580	10.508	15.073
1977-78	0.509*	4.277*	10.840	15.625

Subvention Entitlements (in millions of dollars)

Fiscal Year	Counties	Cities	Total
1972-73	8.781	0.022	8.803[1]
1973-74	9.655	0.029	9.684
1974-75	10.506	0.033	10.539
1975-76	11.330	0.042	11.372[2]
1976-77	12.127	0.040	12.162
1977-78	12.531	0.073	12.605
Totals	64.930	0.239	65.165

Acreage Removed from Open Space Subvention Program

Fiscal Year	Urban Prime	Other Prime	Nonprime	Total
1972-73	1,450	633	10,925	13,008
1973-74	842	831	15,948	17,621
1974-75	998	890	4,860	6,748
1975-76	443	1,555	10,487	12,485
1976-77	581	1,686	15,586	17,853
1977-78	3,064	820	17,410	21,294
Totals	7,378	6,416	75,216	89,010

Method of Removal (Number of Parcels)

Fiscal Year	Non Renewals	Cancel-lations	Eminent Domain	Rescissions
1972-73	77	8	51	3
1973-74	25	14	13	8
1974-75	33	14	25	4
1975-76	59	27	56	16
1976-77	106	24	27	0
1977-78	71	110**	43	2
Totals	371	197	215	33

Acres Cancelled & Cancellation Fees Deposited in General Fund

Fiscal Year	Cancellation Fee	Acres Cancelled: Urban Prime	Acres Cancelled: Other Prime	Acres Cancelled: Non Prime
1972-73	$ 87,425	15	151	544
1973-74	100,985	79	141	6120
1974-75	133,642	303	69	141
1975-76	387,163	64	743	2697
1976-77	398,563	302	234	2849
1977-78	477,940	354	396	11398**
Subtotal		1117	1,734	23,749
Total	$1,585,719		26,600	

Estimated Tax Loss to Local Governments Resulting From Participation in Williamson Act[3] (in millions of dollars

Fiscal Year	Counties	Cities	Total
1972-73	8.903	0.112	9.015
1973-74	5.818	0.093	5.911
1974-75	7.829	0.136	7.965
1975-76	10.442	0.171	10.613
1976-77	11.334	0.206	11.540
Totals	44.326	0.718	45.044

Parcel Data

Fiscal Year	Total Number Parcels Under Contract	Total Restricted Assessed Value	Average Parcel Size	Average New Parcel Size
1974-75	$ 84,405	723,668,139	163 Ac.	-
1975-76	90,048	776,806,192	160 Ac.	122 Ac.
1976-77	95,887	958,786,106	157 Ac.	111 Ac.
1977-78	101,964	962,355,514	153 Ac.	91 Ac.

[1] Total Payment = 5.829 because of lack of sufficient funds
[2] Total Payment = 10.114 because of lack of sufficient funds
[3] Computed under the provision of Open Space Subvention Act less entitlements received. The tax revenue loss calculation was eliminated by Chapter 658 (76)

*Chapter 658 (76) change in the definition of urban prime
**Chapter 176 (76) reflects land removed by cancellation and zoned timber preserve. Subventions will continue on nonrenewals until the 1981-82 F.Y.

Resources Agency
Department of Conservation
Open Space Subvention Entitlements
1978–79 Fiscal Year

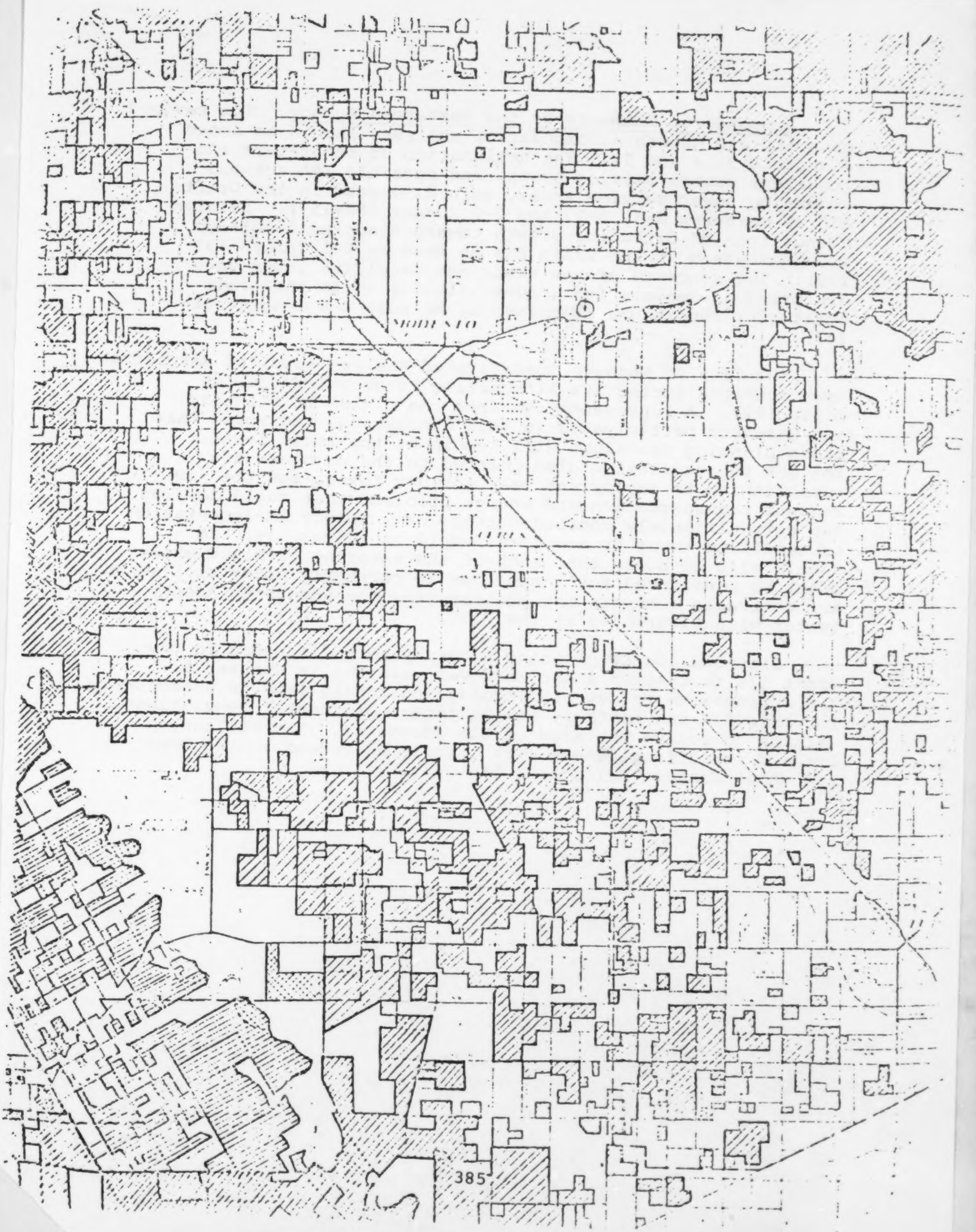
City	Urban Prime Land				Other Prime Land		Nonprime Land				
	Acres	Entitlement $8.00 per Acre	Acres	Entitlement $5.00 per Acre	Acres	Entitlement $1.00 per Acre	Acres	Entitlement $0.40 per Acre	Total Acreage Under Contract	Acreage Entitlement	Allowabl Entitleme
lsbad	323.00	2,584.00	-0-	-0-	-0-	-0-	20.00	8.00	343.00	2,592.00	2,592
narillo	941.00	7,528.00	-0-	-0-	-0-	-0-	56.00	22.40	997.00	7,550.40	7,550
chella	-0-	-0-	-0-	-0-	460.00	460.00	-0-	-0-	460.00	460.00	460
ona	960.00	7,680.00	-0-	-0-	-0-	-0-	3.00	1.20	963.00	7,681.20	7,681
mont	1,041.00	8,328.00	-0-	-0-	-0-	-0-	20,829.00	8,331.60	21,870.00	16,659.60	16,659
f Moon Bay	-0-	-0-	-0-	-0-	202.00	202.00	-0-	-0-	202.00	202.00	202
ward	144.00	1,152.00	-0-	-0-	-0-	-0-	2,061.00	824.40	2,205.00	1,976.40	1,976
o	-0-	-0-	239.00	1,195.00	-0-	-0-	-0-	-0-	239.00	1,195.00	1,195
ne	110.00	880.00	-0-	-0-	-0-	-0-	912.00	364.80	1,022.00	1,244.80	1,244
lo Park	-0-	-0-	-0-	-0-	-0-	-0-	1,922.00	768.80	1,922.00	768.80	768
ark	126.00	1,008.00	-0-	-0-	-0-	-0-	-0-	-0-	126.00	1,008.00	1,008
ard	1,021.00	8,168.00	-0-	-0-	-0-	-0-	25.00	10.00	1,046.00	8,178.00	8,178
Alto	129.00	1,032.00	-0-	-0-	-0-	-0-	353.00	141.20	482.00	1,173.20	1,173
lands	500.00	4,000.00	-0-	-0-	-0-	-0-	-0-	-0-	500.00	4,000.00	4,000
ville	-0-	-0-	-0-	-0-	-0-	-0-	2,513.00	1,005.20	2,513.00	1,005.20	1,005
amento	1,249.00	9,992.00	-0-	-0-	-0-	-0-	62.00	24.80	1,311.00	10,016.80	10,016
Jose	606.00	4,848.00	-0-	-0-	-0-	-0-	7,130.00	2,852.00	7,736.00	7,700.00	7,700
toga	31.00	248.00	-0-	-0-	-0-	-0-	202.00	80.80	233.00	328.80	328
usand Oaks	-0-	-0-	-0-	-0-	-0-	-0-	372.00	148.80	372.00	148.80	148
ville	382.00	3,056.00	-0-	-0-	-0-	-0-	-0-	-0-	382.00	3,056.00	3,056
TALS	7,563.00	60,504.00	239.00	1,195.00	662.00	662.00	36,460.00	14,584.00	44,924.00	76,945.00	76,945

* Maximum Allowable Entitlement based on Section 16142.5 of the Government Cod

Pursuant to Section 16144 of the Government Code, applications for open space subventions from the above local governments have been received and reviewed. I certify that the amount shown in the column, Maximum Allowable Entitlement, is true and correct to the best of my knowledge and is the actual amount to which the local government is entitled under current statutes.

Date: June 14, 1979

Secretary for Resources
Deputy


MODESTO
CERES

Response to Comments By the Resources Agency. The revised capacity and growth accommodation analyses should be noted (Chapters 3, 4 and 5). The designation of short-term and long-term sewage service areas, and possible EPA actions regarding sewer service areas, were discussed in the Draft EIS as Measures D-1, D-2, and D-3 (pages 154-157). Related discussions of directing growth toward nonprime farmlands were discussed in the Draft EIS as Measure C-1 (pages 137-139). The concepts of new towns and satellite towns were discussed as Measure C-5 (pages 141-142) while the urban strategies report was discussed as Measure C-6 (pages 142-143).

The City of Modesto investigated the new town and satellite town concepts during its Alternative Futures Symposia in early 1978. A representative from the Office of Planning and Research participated in this discussion, and noted that urban planning decisions will remain at the local level. The OPR representative also pointed to the problems of establishing an employment base for new towns, and the subsequent transportation and energy problems that could develop. The city ultimately concluded that local agency implementation of satellite towns or new towns would be infeasible. It should also be noted that much of the nonprime farmland which might be considered for a new town is currently under Williamson Act contracts (compare map accompanying the Resources Agency letter with Figure 5-5 of the EIS).

City and county planning programs were discussed in the Draft EIS in Chapter 4 and wherever relevant in Chapter 5. A comprehensive review of planning and zoning laws is unnecessary for this EIS and contrary to the intent of federal regulations seeking to reduce the size of EIS documents. The Williamson Act and its effectiveness were briefly discussed in the Draft EIS under Measure F-1 (pages 166-167).

Comments From Federal Agencies

Advisory
Council On
Historic
Preservation

1522 K Street NW.
Washington D.C.
20005

Reply to: P. O. Box 25085
Denver, Colorado 80225

(HE-153)9

June 8, 1979

Mr. Paul De Falco, Jr.
Regional Administrator
Environmental Protection Agency
Region IX
215 Fremont Street
San Francisco, California 94105

Dear Mr. De Falco:

This is to acknowledge receipt of the draft environmental statement for modification of the wastewater treatment and disposal facilities at the City of Modesto, Stanislaus County, California, on May 9, 1979. We regret that we will be unable to review and comment on this document in a timely manner pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969.

Nevertheless, the Environmental Protection Agency is reminded that, if the proposed undertaking will affect properties included in or eligible for inclusion in the National Register of Historic Places, it is required by Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320) to afford the Council an opportunity to comment on the undertaking prior to the approval of the expenditure of any Federal funds or prior to the issuance of any license. The Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800.4) detail the steps an agency is to follow in requesting Council comment.

Generally, the Council considers environmental evaluations to be adequate when they contain evidence of compliance with Section 106 of the National Historic Preservation Act, as amended. The environmental documentation must demonstrate that either of the following conditions exists:

1. No properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will not affect any such property. In making this determination, the Council requires:

--evidence that the agency has consulted the latest edition of the National Register (Federal Register, February 6, 1979, and its monthly supplements);

--evidence of an effort to ensure the identification of properties eligible for inclusion in the National Register, including evidence of contact with the State Historic Preservation Officer, whose comments should be included in the final environmental statement.

2. Properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will or will not affect any such property. In cases where there will be an effect, the final environmental statement should contain evidence of compliance with Section 106 of the National Historic Preservation Act through the Council's regulations, "Protection of Historic and Cultural Properties".

Should you have any questions, please call Jane King at (303) 234-4946, an FTS number.

Sincerely,

Louis S. Wall
Chief, Western Office
of Review and Compliance

Response to Comments By the Advisory Council on Historic Preservation. As of September 11, 1979 only three sites in Stanislaus County had been placed on the National Register of Historic Places. Two of these are in the extreme eastern part of the county (Knights Ferry and La Grange vicinities), while the third, McHenry Mansion, is in downtown Modesto. None would be influenced by the proposed project.

Once a selection of storage pond and irrigation site alternatives is made, the City of Modesto will arrange for a field investigation to determine whether any archeological or historical resources would be affected. As part of the city's environmental impact report (prepared pursuant to state legislation), a records search has already been conducted. The results of that record search are attached (excerpted from Appendix F of J. B. Gilbert & Associates, 1978).

CALIFORNIA STATE COLLEGE, STANISLAUS

800 Monte Vista Avenue, Turlock, California 95380

RECEIVED
APR 10 1978
J. B. GILBERT & ASSOCIATES

6 April 1978

Kris P. Lindstrom
J.B. Gilbert & Associates
Planning and Engineering Consultants
723 S Street
Sacramento, CA 95814

Dear Mr. Lindstrom:

We have conducted a search of the records for Stanislaus County with reference to the area which could be impacted by the proposed expansion or improvements of the Modesto Wastewater treatment facilities. There are eleven cultural resources loacted in or near the project area. These sites are located on four of the eight pertinent USGS 7.5' quadrangles. The list of sites (attached) does not give specific locations, in keeping with policy regarding cultural resource administration, but does identify on which USGS quadrangle the sites appear.

In view of the extremely high archeological sensitivity of the proposed project area, in my professional opinion no operations which involve trenching or any other kind of earth disturbance should be conducted without a two-phase archeological cultural resource investigation: Phase I being reconnaissance of the surface of proposed and alternate routes for pipelines and ponds, followed by Phase II: monitoring during actual ground-breaking of the pipeline routes and pond development to inspect the subsurface for evidence of buried remains of cultural significance. We will be happy to provide services for you in Phase I and II, or recommend someone who can if we are unable to do so by reason of prior committments.

Sincerely yours,

L. Kyle Napton, Ph. D., Regional Officer
District Ten Site Data Repository
Professor of Anthropology

cc: District Ten File

Attachment

LKN/eag

THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

Archeological Cultural Resources Located In or Near Areas Which Might be Impacted by Proposed Exapnsion of Modesto Wastewater Treatment Facilities, Stanislaus County, California

Name or Number of Site	USGS 7.5' Quadrangle on Which it is Located
"Bozenats"	Westley
STA-30	"
STA-31	"
STA-23	Ripon
STA-26	"
"Gomes Gulch"	Brush Lake
"Eucalyptus Point"	"
"I"	"
STA-28	Crows Landing
STA-133	"
STA-122	"

(HE-153) 8

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

SPKED-W

6 June 1979

Mr. Paul DeFalco, Jr., Regional Administrator
U.S. Environmental Protection Agency, Region IX
215 Fremont Street
San Francisco, California 94105

Dear Mr. DeFalco:

This is in response to your April 1979 request for comments on the Draft Environmental Impact Statement (EIS) for the city of Modesto Wastewater Facilities Improvements, Grant No. CA-06-1063, located in Stanislaus County, California.

We have completed our review of the draft EIS and find that the EIS indicates that a pipeline river crossing will be required on the San Joaquin or Tuolumne Rivers. It should be noted that a Department of the Army permit is required for such work under Section 10 of the River and Harbor Act of 3 March 1899 (USC 403) since both of these river reaches are navigable waterways of the United States. In addition, a Department of the Army permit is required under Section 404 of the Clean Water Act (33 USC 1344); however, a Nationwide Permit has been issued for utility crossings under Section 404, provided that the work meets the conditions listed in the inclosed information sheet.

We appreciate the opportunity to review and comment on this report.

Sincerely,

GEORGE C. WEDDELL
Chief, Engineering Division

1 Incl
As stated

Information Sheet
Section 404 of the Clean Water Act
Nationwide Permit for Utility Line Crossings

Section 404 of the Clean Water Act requires Department of the Army approval prior to the discharge of dredged or fill material into waters of the United States or adjacent wetlands. This approval is granted in the form of a Department of Army Permit issued by the U.S. Army Corps of Engineers. Permits may be individual permits authorizing a single specified discharge, or general permits authorizing specified types of discharges in a specified waterway or group of waterways. Acting under this authority the Corps of Engineers has issued a Nationwide General Permit for the placing of dredged or fill material for backfill or bedding of utility line crossings provided the following conditions are satisfied:

a. The watercourse is returned to preconstruction bottom contours and all excess material is removed to an upland disposal area.

b. That the discharge will not be located in the proximity of a public water supply intake.

c. That the discharge will not occur in areas of concentrated shellfish production.

d. That the discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species.

e. That the discharge will not disrupt the movement of those species of aquatic life indigenous to the waterbody.

f. That the discharge will consist of suitable material free from toxic pollutants in other than trace quantities.

g. That the discharge will not occur in a component of the National Wild and Scenic River System or in a component of a State Wild and Scenic River System.

The following management practices should be followed to the maximum extent practicable to minimize the adverse effects of the discharge on the aquatic environment:

a. Discharges in spawning areas during spawning seasons should be avoided.

b. Discharges in wetland areas should be avoided.

c. Heavy equipment working in wetlands should be placed on mats.

d. Discharges into breeding and nesting areas for migratory waterfowl should be avoided.

This Nationwide General Permit applies only to the authorization required under Section 404 of the Clean Water Act. THIS PERMIT DOES NOT OBVIATE THE REQUIREMENT TO OBTAIN ANY STATE, LOCAL, OR OTHER FEDERAL APPROVAL REQUIRED BY LAW. Utility lines crossing those waters which have been determined to be "navigable waters of the United States" must receive a Department of Army approval under Section 10 of the Rivers and Harbor Act of 1899.

If you have any questions or need additional information concerning the Nationwide General Permit, please contact our Regulatory Section, Room 6540, or telephone (916) 440-2324.

Response to Comments By the Corps of Engineers. These comments have been incorporated into Chapter 10 of the Final EIS.

(HE-153) 3

United States Department of the Interior

FISH AND WILDLIFE SERVICE
LLOYD 500 BUILDING, SUITE 1692
500 N.E. MULTNOMAH STREET
PORTLAND, OREGON 97232

April 30, 1979

In reply refer to:
AFA-SE - 1-1-79-F-52

Mr. Paul De Falco, Jr.
Regional Administrator
Environmental Protection Agency
Region IX
215 Fremont Street
San Francisco, California 94105

Dear Mr. De Falco:

This is in further response to your letter of March 6, 1979, requesting formal Section 7 consultation on the proposed improvement of the sewage treatment plant (at the City of Modesto). By letter of March 15, 1979, we informed you that the consultation could not be initiated until we determined the adequacy of the "biological assessment" (EIS) as required by Section 7(c) of the Endangered Species Act as amended.

We have reviewed the subject EIS and have determined that all listed or proposed endangered and threatened species were adequately addressed. We are, therefore, acknowledging your consultation request and designating it as case number 1-1-79-F-52. Please refer to this case number on any further correspondence.

We are assigning field work for this consultation to our Area Manager at the following address:

William D. Sweeney
2800 Cottage Way
Room E-2740
Sacramento, CA 95825
Phone: FTS 468-4664

His staff will likely want to review the project with your staff and may need additional information. We will notify you of our conclusion within 90 days of the date of this letter as required by the recent amendments to the Endangered Species Act.

We would also like to take this opportunity to point out that a candidate plant species, Cirsium crassicaule (slough thistle), occurs in wet, grassy meadows along the San Joaquin River. This species is presently being reviewed by this Service for consideration to propose and list as endangered or threatened. Specimens of this species have been collected just north of San Joaquin City, not far downstream from the proposed oxidation pond site. It should be noted that candidate species have no protection under the Endangered Species Act and are discussed here for your information only. However, it is this Service's policy to provide informal consultation, if requested, for such species. One benefit of informal consultation to the consulting agency is to provide the necessary planning alternatives should the species become listed before completion of the project.

Sincerely yours,

E. B. Chamberlain, Jr.
Assistant Regional Director
Federal Assistance

(HE-153) 16

United States Department of the Interior

FISH AND WILDLIFE SERVICE
LLOYD 500 BUILDING, SUITE 1692
500 N.E. MULTNOMAH STREET
PORTLAND, OREGON 97232

July 31, 1979

In reply refer to:
AFA-SE, #1-1-79-F-52

Mr. Paul De Falco, Jr.
Regional Administrator
Environmental Protection Agency
Region IX
215 Fremont Street
San Francisco, California 94105

Dear Mr. De Falco:

This letter responds to your March 6, 1979, request for formal consultation pursuant to Section 7 of the Endangered Species Act of 1973 as amended in 1978 (PL 95-632). At issue are the potential effects of the proposed expansion and improvements of the City of Modesto sewage treatment plant (STP) in Stanislaus County, California, upon the wintering habitat of the endangered Aleutian Canada goose (ACG) (Branta canadensis leucopareia).

As described in the April 1979 Draft Environmental Impact Statement (Modesto Wastewater Facilities Improvements) prepared by the Environmental Protection Agency, the City of Modesto proposes to add a new 15 MGD (million gallons per day) influent pump station and additional onsite structures to existing facilities. Also the City is pursuing development of an irrigation reuse system for treated effluent which will greatly reduce total discharges to the San Joaquin River. The irrigation reuse aspects of the project would require a new 100- to 220-acre storage pond, numerous pipelines and associated pumps for effluent distribution, and a program of intermittent winter discharges to the San Joaquin River to reduce effluent storage requirements. Three of the eight proposed alternative irrigation plans include the wintering area of the ACG.

On July 12, 1979, a biologist from the U.S. Fish and Wildlife Service, Sacramento Endangered Species Office, met with representatives from the Modesto STP and the San Luis National Wildlife Refuge to conduct a field investigation of the existing sewage facilities and proposed irrigation sites. Available information regarding the project and ACG ecology were discussed at that time. In addition, two other endangered species were considered in the evaluation.

The endangered blunt-nosed leopard lizard (Crotaphytus (=Gambelia) silas) was originally found throughout the San Joaquin Valley and surrounding foothills, but its range has been severely restricted by urbanization and agricultural development. It inhabits sparsely vegetated plains, alkali flats, washes, and low foothills. Because the area to be affected by the Modesto STP is managed for agriculture and because the species has not been sighted north of Merced (Brode, pers. comm.), the blunt-nosed leopard lizard will not be considered in this consultation.

It is also unlikely that the slough thistle (Cirsium crassicaule), a candidate plant species, would be found in the proposed storage pond site. It has been reported from bottomlands of the San Joaquin Valley in Kern and King Counties and disjunctly in central San Joaquin County (Fuller, 1979). The storage pond is a dry upland site; the slough thistle has been associated with riparian communities.

The endangered ACG was once abundant in the western Aleutian Islands of Alaska; however, the present breeding population is restricted to Buldir Island. It appears to winter primarily in California. The decline of the species is largely attributed to predation by Arctic foxes which were introduced to nesting islands by Russian and American trappers from about 1836 to 1930; other contributory factors are hunting mortality outside established closure areas in the California wintering grounds, and loss of wintering habitat (ACG Recovery Team, 1979).

Approximately 70% of the ACG population utilized the irrigated pastures of the Faith and Mapes ranches (Lyons property) near Modesto in the Central Valley as a wintering area in 1978-9 (mid-November to early February). The geese roost on ponds, flooded fields, and on occasion on the Modesto STP oxidation ponds. They prefer irrigated pasture lands for feeding, although they also utilize harvested corn and bean fields. Most of the land in the valley is devoted to cultivated row crops and orchards.

The owners of the Faith and Mapes ranches have been helpful in protecting the ACG. They have cooperated in establishing hunting closures on their land which undoubtedly encourages the geese to return. More importantly, the geese are allowed to compete with cattle for food on the pasture lands. The ACG has received and, apprently, will continue to receive favored status and protection from the landowners (Lehenbauer, pers. comm.).

No direct adverse impacts upon the ACG are anticipated from the various construction aspects of the Modesto STP expansion. Seven of the eight properties suggested for effluent reuse irrigation are intensively cultivated and do not constitute prime wintering area for the ACG; consequently, the ACG should not be affected. Effluent irrigation of the Lyons property (including Faith and Mapes ranches) should have no impact upon the ACG as long as the agricultural use remains unchanged. This action may, in fact, increase forage on the pasture land and lessen feeding competition with livestock. Utilization of effluent irrigation as an inducement to alter land use to row crops would be totally unacceptable because valuable ACG wintering habitat would be lost.

In conclusion, it is our Biological Opinion that the proposed expansion of the Modesto STP, creation of an additional storage pond, and effluent irrigation of adjacent farmland is not likely to jeopardize the continued existence of the Aleutian Canada goose or adversely modify habitat utilized as a wintering area.

However, to aid in the conservation of the species should the Lyons property be selected as an effluent reuse irrigation site, it is recommended that:

1) Irrigation pipeline construction be completed between March and October to avoid disturbance of the geese during the wintering period; and

2) Livestock grazing remain the primary agricultural use of the Lyons property.

This concludes our formal consultation on this project. However, should project modifications occur, reinitiation of consultation should be considered.

Sincerely yours,

Bill Meyer

William H. Meyer
Acting Regional Director

REFERENCES CITED

Aleutian Canada Goose Recovery Team. 1979. Recovery Plan. U.S. Fish and Wildlife Service. 42 pp.

Brode, J. Wildlife Biologist, California Department of Fish and Game and Blunt-nosed Leopard Lizard Recovery Team Leader.

Fuller, T.C. 1979. Unpublished Status Report on Cirsium crassicaule submitted to the California Native Plant Society.

Hegel, T. Supervisor, City of Modesto Wastewater Treatment Plant.

Lehenbauer, P.A. Staff Biologist, U.S. Fish and Wildlife Service and Aleutian Canada Goose Recovery Team Member.

Milton, J.F. Assistant Refuge Manager, San Luis National Wildlife Refuge, U.S. Fish and Wildlife Service.

Response to Comments By the Fish and Wildlife Service. The biological opinion of the Fish and Wildlife Service is consistent with the conclusions in the Draft EIS. Chapter 11 of the Final EIS has been revised to reflect the information on the slough thistle.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
630 Sansome Street
San Francisco, California 94111

(HE-153) 6

C'D BY E.P.A
REGION IX
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1950 (AP&D)
May 31, 1979

Mr. Paul DeFalco, Jr.
Regional Administrator
Environmental Protection Agency, Region IX
215 Fremont Street
San Francisco, California 94105

Dear Paul:

Thank you for the opportunity to review the Draft Environmental Impact Statement for the Modesto Wastewater Facilities Improvements. Potential impacts of air pollution on forest vegetation are adequately discussed in the draft.

Sincerely,

for John Chaffin
ZANE G. SMITH, JR.
Regional Forester

LIST OF SEPARATE APPENDICES

Socio-Economic Appendices

Appendix A - Socio-Economic Setting and Forecast

Appendix B - Land Use Setting and Forecast

Prime Farmlands Appendices

Appendix C - Status of Prime Farmland: National, California, and Stanislaus County

Appendix D - Identification of Prime Agricultural Lands in the Modesto Region

Appendix E - Hydrogeology of the Montpelier Area

Effluent and Sludge Impacts Appendices

Appendix F - Effluent Impacts on Soils and Crops

Appendix G - Sludge Processing and Disposal

Appendix H - Water Quality Impacts of Present River Discharge

Air Quality Appendices

Appendix I - Background Information on Air Pollution

Appendix J - Assessment of Ozone Transport From the Bay Area to the San Joaquin Valley

Appendix K - Air Quality Assessment of Growth Accommodated by the Proposed Project

AGENCIES AND INDIVIDUALS CONTACTED DURING PREPARATION OF THE DRAFT AND FINAL EIS

U. S. Environmental Protection Agency

Russ Beckwith
Jerry Clifford
John Hamill
Dave Henderson
Dave Jones
Imants Kresse
Edward Miller
Coe Owen
Rich Williamson
Mark Zuckerman

U. S. Soil Conservation Service

Gary Bullard
Darwin Briggs
Dick Flenner
Eldon Glenn
James Hansen
George Hartman
Bob Miller
Ronald Moore
John Reganold

U. S. Fish and Wildlife Service

Diane Weinrich

U. S. Army Corps of Engineers

Mr. Probasco

State Water Resources Control Board

Steve Viani
Jeff Cook
Mike Falkenstein
Anand Mamidi
Don Perrin
Mike Stallard
Kurt Wasserman
Howard Whitver

Central Valley Regional Water Quality Control Board

Sterling Davis
Richard Rose
Susan Shepherd

California Air Resources Board

Vijay Bhargava
Suzanne Butterfield
Leon Dolislager
Bob Giorgis
Arndt Lorenzen
Bill Loscutoff
Nancy Matthews
Art Mills
Mike Redemer
Jerry Schiebe
Freeman Smith
Carolyn Stromberg
F. Jerry Wiens
Tony Xavier

California Department of Fish and Game

Edward Armstrong
John Brode
John Gustafson

California Department of Water Resources

Bill Clark
Victor McIntyre
Glenn Sawyer

California Department of Health

Gunter Redlin

California Department of Food and Agriculture

Michele Marlowe-Lawrence
Art Millecan
Pat Minyard
Bob Rollins

California Office of Planning and Research

Katie Easterwood
Katherine Tobias
Steve Williamson
Woodrow Wilson

California Energy Commission

Bob Hodam

California Department of Housing and Urban Development

Tom Johnson
Jack Kern

California Department of Employment Development

Rosalind Hackett
Segei Mamura
Steve Saxon

California Department of Transportation

Leo Fong
Al Johnson
C. Robert Price

California Legislature

Lou Angelo - Senate Office of Research
William Kier - Senate Office of Research
Anne Prosser - Legislative Aide, Senator Garamendi
Hon. John Thurman - Assemblyman
Tom Willoughby - Legislative Aide, Assemblyman Victor Calvo

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DOCUMENTATION

References Cited

Arnold, E. E., et al. 1949. Report upon reclamation of water from sewage and industrial waste in Los Angeles County, California. Public Health Engineering Abstracts 30(3):23; 1950.

Ayres, R. S., and D. W. Westcot. 1976. Water quality for agriculture. United Nations Food and Agriculture Organization.

Baars, J. K. 1957. Travel of pollution and purification enroute in sandy soil. Bulletin W.H.O. 16: 727.

Bellrose, F. C. 1976. Ducks, geese and swans of North America. A Wildlife Management Institute book sponsored jointly with the Illinois Natural History Survey. 583 pp.

Bennett, Jesse H. and A. Clyde Hill. 1973. Absorption of gaseous air pollutants by a standard plant canopy. J. Air Poll. Cont. Assoc. 23(3): 203-206.

Bouwer, H. et al. 1974. High-rate land treatment II: water quality and economic aspects of the Flushing Meadows project. J. Water Poll. Cont. Fed. 46(5): 844-859.

Brown and Caldwell, Consulting Engineers. 1966. Modesto sewerage survey. Prepared for the City of Modesto and Stanislaus County. 138 pp. + app.

Burge, Wylie D., and Paul B. Marsh. 1978. Infectious disease hazards of landspreading sewage wastes. J. Environ. Quality 7(1).

California Administrative Code. Title 22, division 4, chapter 3. Reclamation criteria.

California. Air Resources Board. Agency files - basic tab reports for 1975-77 (hourly ambient air quality data).

----------. 1970-1978. California air quality data (Quarterly publication).

----------. 1974a. California air quality data, supplement for environmental impact assessments no. 1.

----------. 1974b. Ten year summary of California air quality data, 1963-1972.

----------. 1976a. Ambient air quality standards. ARB fact sheet 38 (revised).

----------. 1976b. California air quality data, summary of 1976 air quality data, gaseous pollutants. Vol. VIII, annual summary.

----------. 1976c. California air quality data, vol. VIII, no. 1 (January-March, 1976).

----------. 1976d. California air quality data, vol. VIII, no. 2 (April-June 1976).

----------. 1977a. California air quality data, summary of 1977 air quality data, gaseous and particulate pollutants. Vol. IX, annual summary.

----------. 1977b. Plan development program for an air conservation program for California (revised, February 1977).

----------. 1978a. 1976 emission inventory, San Joaquin Valley air basin, Stanislaus County, 10-6-78 draft.

California. Department of Finance. 1974. Population estimates for California cities and counties, January 1, 1973 and January 1, 1974. Report 74 E-1.

----------. 1976. Population estimates for California cities and counties, January 1, 1975 and January 1, 1976. Report 76 E-1.

----------. 1977a. Population estimates for California cities and counties. Report 77 E-2. December 22, 1977.

----------. 1977b. Population estimates for California cities and counties, January 1, 1976 and January 1, 1977. Report 77 E-1.

----------. 1977c. Population projections for California counties 1975-2000 with age/sex detail to 2000. Series E-150. Report 77-P3.

----------. 1978. Population estimates for California cities and counties, January 1, 1977 and January 1, 1978. Report 78 E-1.

----------. 1979. Population estimates for California cities and counties, January 1, 1978 and January 1, 1979. Report 79 E-1.

California. Dept. of Fish and Game. 1978. At the crossroads. A report on California's endangered and rare fish and wildlife. 103 pp.

California. Dept. of Health. 1978a. Considerations of chemical substances in sewage sludge added to soil that will produce an edible crop: a public health perspective.

----------. 1978b. Criteria for mosquito prevention in wastewater reclamation on disposal projects. Memo. data 1/25/78.

California. Dept. of Transportation. 1975. Computer printout of employment by industry, population, and housing data (special survey in 1970 and 1975). Provided by Robert Price, transportation planner, District 10.

----------. 1977. Route 108 corridor study. District 10.

----------. 1978. Stanislaus area transportation study, report on travel forecasts. Prepared for Stanislaus Area Association of Governments. (District 10).

California. Dept. of Water Resources. 1974. The California water plan - outlook in 1974. Bulletin 160-74.

California. Employment Development Department. 1976. Stockton metropolitan area wage and salary employment, by industry, and labor force, employment and unemployment, 1972-1976.

----------. 1977. Small farm viability project. The family farm in California.

California. Energy Resources Conservation and Development Commission. 1975. Quarterly fuel and energy summary, vol. 1, no. 1-4.

----------. 1976. Quarterly fuel and energy summary, vol. 2, no. 1-4.

California. Legislature. 1977a. Agricultural land preservation: evaluation and critique, AB 1900. Prepared by Assembly Committee on Resources, Land Use and Energy.

----------. 1977b. Background material on the California Agricultural Lands Act (AB 222). Prepared by Assembly Committee on Resources, Land Use and Energy.

California Native Plant Society. 1974. Inventory of rare and endangered vascular plants of California. Special publ. no. 1. 56 pp.

California. Office of Planning and Research. 1974. Prime agricultural land report.

California. State Water Resources Control Board. 1954. Studies of wastewater reclamation and utilization. SWRCB publ. no. 9.

----------. 1975. Water quality control plan report. Sacramento River Basin (5A); Sacramento-San Joaquin Delta Basin (5B); San Joaquin Basin (5C), vols. I&II.

California State Automobile Association. 1976. Map of Modesto, Ceres and vicinity.

Campbell, Ross. 1979. Treatment plant flow data. Letter to Bob Sculley, Jones & Stokes Associates, dated August 21, 1979.

Ceres, city of. 1976. Information report (1976 land use data).

Congressional Research Service. 1978. Document IB 70813.

Cooper, R. C. 1974. Wastewater management and infectious disease, part I: disease agents and indicators. J. Environ. Health 37(3): 217-224.

Cotner, M. L. 1975. Farmland: will there be enough? U. S. Department of Agriculture, ERS no. 584.

Dideriksen, R. I. 1977. Potential cropland study. U. S. Department of Agriculture Statistical Bulletin no. 578.

D'Itri, F. M., ed. 1977. Wastewater renovation and reuse. Marcel Dekker, Inc., NY.

Eckholm, Erick. 1976. Losing ground: environmental stress and world food prospects. W. W. Norton & Co. for the Worldwatch Instit.

H. Esmaili & Associates. 1978. Evaluation of health impact of abandoned Modesto oxidation ponds and the Carpenter Road landfill on the Tuolumne River Regional Park. Prepared for the City of Modesto. 28 pp.

Fletcher, Wendell W. 1978. Agricultural land retention: an analysis of the issue, a survey of recent state and local farmland retention programs, and a discussion of proposed federal legislation. Congressional Res. Serv. Publ. 78-177 ENR.

Fogel, Ira L. 1978. Noise levels in Modesto. Memo to Public Services Inspector, City of Modesto, dated October 13, 1978.

Garrigan, George A. 1977. Land application guidelines for sludge contaminated with toxic elements. J. Water Poll. Cont. Fed. 49(12): 2380-2389.

Gerba, G. T., et al. 1975. Fate of wastewater bacteria and viruses in soil. J. Irrigation & Drainage Div., ASCE 101: 157.

J. B. Gilbert & Associates. 1976. Draft environmental impact report, Modesto wastewater facilities improvements. Supplement to draft EIR. Prepared for the City of Modesto,

----------. 1978. Subsequent environmental impact report, reuse of wastewater effluent for agricultural irrigation. Prepared for the City of Modesto.

----------. 1979. Final supplement to subsequent EIR, reuse of wastewater effluent for agricultural irrigation. Prepared for the City of Modesto.

Gilbert, R. G., et al. 1976. Wastewater renovation and reuse: virus removal by soil filtration. Science 192 (4243):1004.

Gilcreas, F. W., and S. A. Kelly. 1955. Relation of coliform organism test to enteritic virus pollution. J. Am. Water Works Assoc. 47:683.

Goldman, George and David Strong. 1977. Cost revenue study. Governmental costs and revenues associated with implementing the Modesto urban area general plan policies in the northeast Modesto region. Cooperative Extension Services, Univ. of Calif.

Gottas, H. B. 1953. Field investigation of wastewater reclamation in relation to groundwater pollution. Calif. State Water Resources Control Board Publ. no. 6.

Hansen, D. P. and S. I. Schwartz. 1976. The California Land Conservation Act. J. Soil and Water Conserv. 3(5).

Hill, A. Clyde. 1971. Vegetation: a sink for atmospheric pollutants. J. Air Pollut. Control Assoc. 21(6):341-346.

Halloway, J. 1977. Urbanization of California's agricultural resources. An overview report by the Urban/Agricultural Resources Management Task Force. Visalia Planning Dept., Visalia, CA. 16 pp.

Jenks & Harrison. 1976. City of Modesto wastewater treatment and disposal facilities project report.

----------. 1978a. Draft project report supplement, reuse of wastewater effluent for agricultural irrigation. Prepared for the City of Modesto.

----------. 1978b. City of Modesto facilities plan supplement, sludge disposal.

----------. 1979. Project report supplement, reuse of wastewater effluent for agricultural irrigation. Prepared for the City of Modesto.

Kirkham, M. B. 1977. Trace elements in sludge on land: effects on plants, soils and groundwater. In: R. C. Loehr, ed. Land as a waste management alternative. Ann Arbor Science, pp. 209-247.

Lee, L. K. 1978. A perspective in cropland availability. U. S. Dept. of Agriculture, Agricultural Economic Report 406.

Lee, Yin-Po. 1975. A study in the structure of the Stanislaus economy.

Mechalas, B. J., et al. 1972. An investigation into recreational water quality. Water quality criteria data book, vol. 4. U. S. EPA.

Milne, Murray. 1976. Residential water conservation. California Water Resources Center Report no. 35. Calif. Water Resources Center, Davis. 468 pp.

Modesto (City of). 1975. Modesto urban growth policy. 6 pp.

----------. 1977a. Application of the City of Modesto for a mass transportation capital assistance grant under the Urban Mass Transportation Act of 1964, section 5.

----------. 1977b. Growth policy review, 1977.

----------. 1977c. Land use and circulation elements, Modesto urban area general plan.

----------. 1977d. Modesto statistical summary: 1977. February 28, 1977 report plus July 28, 1977 supplement.

----------. 1978a. Land use in the Modesto urban area, 1976.

----------. 1978b. Modesto urban trails plan. 12 pp.

----------. 1978c. Modesto traffic flow map. Prepared by Parking and Traffic Dept.

----------. 1978d. Growth policy review, 1978.

National Academy of Sciences. 1970. Land use and wildlife resources. 262 pp.

----------. 1976. Pest control: an assessment of present and alternative technologies. Vol. 5: Pest control and public health. 282 pp.

Page, R. W. 1972. Preliminary appraisal of groundwater conditions in the vicinity of Modesto, California. U. S. Geological Survey Open-file Report.

----------. 1977. Guide for data collection to calibrate a predictive digital groundwater model of the unconfined aquifer in and near the City of Modesto, California. U. S. Geological Survey, Water Resources Investigation 76-41.

Real Estate Research Corporation. 1974. The costs of sprawl: literature review and bibliography. Prepared for the U. S. Council on Environmental Quality, U. S. Dept. of Housing and Urban Development, and U. S. Environmental Protection Agency.

Reed, A. D. 1977. Facts about California agriculture. Univ. of Calif., Div. of Agric. Sciences Leaflet 2290.

Roebeck, G. G. 1961. Groundwater contamination studies of the Sanitary Engineering Center. Robert A. Taft Sanitary Engineering Center technical report W 61-5, pp. 193-197. U. S. Dept. of Health, Education & Welfare.

San Diego County. 1968. San Diego agriculture: problems and prospects.

Santa Clara County. Dept. of Agriculture. 1977. Agricultural crop report.

Singer, M. J., and J. P. Reganold. 1978. Prime agricultural land: alternative definition and policy implementation. Univ. of Calif., Davis, Dept. of Land, Air and Water Resources.

Skolds, M. D. and J. B. Penn. 1977. Production potentials in U. S. agriculture. In: U. S. Dept. of Agriculture. Looking forward: research issues facing agriculture and rural America.

Snyder, R. W. 1976. Agricultural land use policy: some perspectives and observations. U. S. Dept. of Agriculture P76-11.

Stanislaus Area Association of Governments. 1972. Environmental resources management element: agriculture.

----------. 1975. Addendum to draft environmental impact report, Stanislaus area transportation plan.

----------. 1976. Environmental resources management element: agriculture data report.

----------. 1977a. Energy - sources and uses in Stanislaus County. Draft summary and draft data report.

----------. 1977b. Modesto urbanized area air quality consistency report for 1977 regional transportation plan, addendum. Prepared by Caltrans District 10.

----------. 1977c. Transportation improvement program, F.Y. 1977-78 through 1981-82 and annual element, F.Y. 1977-78.

----------. 1978a. Air quality maintenance plan. Report I: analysis of the problem. Prepared by the City of Modesto Public Works Dept. 132 pp.

----------. 1978b. Air quality maintenance plan. Report IV: recommended air quality strategy for Stanislaus County. Draft report plus addendum.

----------. 1978c. Stanislaus area transportation plan, 1978 update, vol. 3. Draft. Prepared by Caltrans District 10.

Stanislaus County. 1971. Domestic water and sanitary sewer plans for urban communities of less than 5,500 population. Prepared by Jorgenson-Tolliday, Engineers.

----------. 1975. Census 1975, volumes I and II. Stanislaus County Dept. of Planning and Community Development.

----------. 1977. Agricultural crop report, 1977. Stanislaus County Dept. of Agriculture.

----------. 1978. Agricultural crop report, 1978. Stanislaus County Dept. of Agriculture.

Stone, R., and W. F. Garber. 1951. Sewage reclamation by spreading basin infiltration. Proc. Am. Soc. Civil Eng. 77(87).

Thomas, Henry. 1978. EPA programs in regulations of surface transportation noise. Noise/News 7(1):13-18.

Thurston, R. V., et al., eds. 1979. A review of the EPA red book: quality criteria for water. Am. Fish. Soc., Bethesda, MD. 313 pp.

United Nations. 1973. Population studies report no. 53.

U. S. Army Corps of Engineers. 1972. Reservoir regulation for flood control, Don Pedro Lake, Tuolumne River. Unpublished report.

U. S. Bureau of the Census. 1962. Census of population, 1960.

----------. 1973. 1970 census of population. Characteristics of the population. Vol. I, part 6 - California.

U. S. Congress. 1977. Clean Air Act amendments of 1977. Public law 95-95. 42 USC 7401 et seq.

U. S. Council on Environmental Quality. 1976. Memorandum for heads of agencies - analysis of impacts on prime and unique farmland in environmental impact statements. August 30, 1976.

----------. 1977. Analysis of impacts on prime and unique farmlands in environmental impact statements. August 30, 1977.

----------. 1978. National Environmental Quality Policy Act. Implementation of procedural provisions, final regulations. Federal Register 43(230): 55978-56007.

U. S. Dept. of Agriculture. 1974. Our land and water resources: current and prospective supplies and uses. USDA Misc. Publ. 1290.

----------. 1977. Agricultural statistics.

U. S. Department of Agriculture. Economic Research Service. 1976. Dynamics of land use change in fast growth areas.

U. S. Environmental Protection Agency. 1971. Noise from construction equipment and operations, building equipment and hcme appliances. NTID 300.1. Prepared by Bolt, Beranek and Newman.

----------. 1975. Preparation of environmental impact statements, final regulations. Federal Register 40(72): 16814-16827.

----------. 1976a. Compilation of air pollutant emission factors. Second edition with supplements 1-7.

----------. 1976b. Quality criteria for water. 256 pp.

----------. 1977. Municipal sludge management: environmental factors. Technical bulletin MCD-28. EPA 430/9-77-004.

----------. 1978a. Background paper in support of EPA policy to protect environmentally significant agricultural lands. Prepared by EPA Office of Land Use Coordination, August 25, 1978.

----------. 1978b. EPA Policy to protect environmentally significant agricultural lands. Sept. 8, 1978.

----------. 1979. Revisions to the national ambient air quality standards for photochemical oxidants. Federal Register 44(28):8202-8221.

U. S. Fish and Wildlife Service. 1978a. Concept plan for waterfowl wintering habitat preservation, Central Valley, California.

----------. 1978b. Guidelines for management of the Central Valley population of greater sandhill cranes.

----------. 1978c. List of endangered and threatened wildlife and plants. Republication. Federal Register 43(248): 58030-58048.

U. S. Food and Drug Administration. 1975. Bureau of Foods compliance program evaluation, F.Y. 1973. Report 7320-08. 21 pp.

U. S. Geological Survey. 1977. Flood insurance study, City of Modesto, Stanislaus County, California.

U. S. National Climatic Center. 1971-1978. Climatological data annual summaries, California. Vols. 75-82, no. 13.

U. S. Soil Conservation Service. 1977. Land inventory and monitoring memorandum - 3 (rev. 1). August 16, 1977.

University of California, Davis. Division of Environmental Studies. 1973. The fiscal impact of alternative land use in Stanislaus County, summary report.

Wellings, F. M., et al. 1975. Pathogenic viruses may thwart land disposal. Water & Waste Eng. 12(3):70.

Winneberger, John H. Timothy. 1974. Manual of grey water treatment practice. Ann Arbor Science Publ., Inc. 102 pp.

Personal Communications Cited in Text

Amstutz, John. January 1978, April 1978. City of Modesto Wastewater Treatment Plant Superintendent.

Armstrong, Ed. March 1978. California Department of Fish and Game.

Baltz, David. December 1978. Stanislaus County Planning Department.

Bottel, Robert. April 1978. Tilie Lewis Foods, Inc.

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Hosegood, Richard. April 1978. City of Modesto Public Works Department.

Londquist, Clark. September 1979. U. S. Geological Survey.

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Robert Jones	X																												
Harold Bissell	X		X								X							X											
Robert Sculley	X		X	X	X	X		X			X	X	X		X	X		X									X	X	X
Nicholas Cimino								X	X						X													X	X
Jeffrey Civian								X																				X	X
Delores Brown												X	X																
Booker Holton													X																
Susan Nicol									X																				
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Roberta Mundie	X		X			X	X		X							X	X		X	X									
Suzanne Lampert			X			X	X												X	X									
Claude Gruen							X												X	X									
Bruce Bernhard							X										X		X										
Jonathan Saiger																			X	X									
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Thayer Watkins*																			X										
H. Esmaili & Associates																													
Houshang Esmaili	X		X				X			X				X		X					X	X	X	X	X				
Suzie Sayre							X			X				X								X		X	X				
Barry Hect										X						X						X	X						
Roy Hills							X															X							
Samuel Scalise																								X					
Charles Almestad																					X	X							
Rodney Arkley*																						X							
Clean Water Consultants																													
Robert Gumerman				X	X											X	X	X											
Hydroscience, Inc.																													
Joseph Alcamo																										X			
Geological Drafting Service																													
Steve Fleming		X																											

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*Special Consultants

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